ALCOHOL AND YOUNG DRIVERS: IMPACT AND IMPLICATIONS OF LOWERING THE DRINKING AGE

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ALCOHOL AND YOUNG DRIVERS:
IMPACT AND IMPLICATIONS OF LOWERING THE DRINKING AGE

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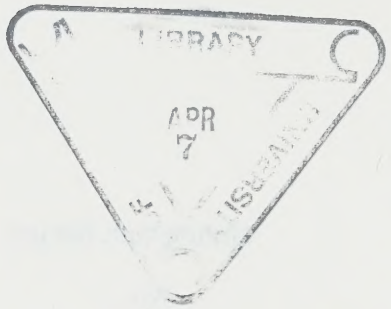

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IMPACT ET RÉPERCUSSIONS DE L'ABAISSEMENT DE L'ÂGE LÉGAL DE CONSOMMATION DE L'ALCOOL

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The views expressed herein are not necessarily those of Health and Welfare Canada. Questions should be addressed to the author: Dr. Paul C. Whitehead, Chairman, Department of Sociology, The University of Western Ontario, London, Canada.

ABSTRACT

ALCOHOL AND YOUNG DRIVERS: IMPACT AND IMPLICATIONS OF LOWERING THE DRINKING AGE

During the early 1970's, scores of jurisdictions enacted legislation that lowered the legal age for the purchase and consumption of alcoholic beverages from 21 years of age to, in most cases, 18 years of age and, in some cases, 19 years of age. Evaluating the impact of liberalizing this alcohol control measure is crucial from both a theoretical and an applied point of view. This study assesses the impact of the change in the drinking age by focussing on the collision behaviour of young drivers in a single community, London, Ontario, over a period of time that includes three and one-half years prior to the change in the drinking age and four years after the change in the drinking age.

This evaluation is conducted within the context of a detailed examination of the available literature on this topic and a critical assessment of the major issues involved. Marked increases in the collision behaviour of young drivers are observed, especially alcohol-involved collisions, and consideration is given to alternative hypotheses that might account for this other than the lowering of the drinking age. In the final analysis, the inference is made that the lowering of the legal drinking age had a real effect in increasing alcohol-related damage among young people in the form of an increased incidence of alcohol-related collisions.

The implications of these findings are discussed in terms of the specific issue of traffic safety and in terms of the prevention of alcohol-related problems in general. Specific suggestions for social policy are aimed at effectively and efficiently preventing alcohol-involved collisions and other forms of alcohol-related damage among young people as well as the general population.

PREFACE

The opportunity to prepare this monograph is welcome because it enables me to bring together three sets of interests that are most meaningful when they intersect: explaining alcohol-related damage, preventing alcohol-related damage, and the conduct of empirical work that is relevant to the other two.

The theoretical and practical issues concerning prevention and preventative questions have been of interest to me since the late 1960's. The specific empirical question is more recent. In the spring of 1973, I was approached by members of the Canada Council of Young Drivers who wanted to formulate a project for the summer. They had a question: "What was the effect of lowering the drinking age on young drivers?" and they had enthusiasm and ambition, but they had no methodology. Three out of four is not bad, so we worked at developing a design that would allow us to assess the impact of the change in the drinking age on the collision behaviour of young drivers. That study was supported by the Canada Council of Young Drivers, which is sponsored by the Insurance Bureau of Canada. At the time, one of these students was in Grade 13 in London and the other three were in their first year of University: one each at the University of Ottawa, Queen's University and the University of Western Ontario. These four persons, Carol MacArthur, Nanci Langford, Bruce Stanton and John Craig, respectively, spent the summer of 1973 at the London Police Department culling and coding information from collision records.

Later, the scope of the original study was extended, thanks to the encouragement of Dr. Irving Rootman and the support provided by the Non-Medical Use of Drugs Directorate. Karen Leitner, Philip Moreash and Suzanne Brook served as research assistants during the summer of 1975.

The cooperation of Chief of Police Walter Johnson, Superintendent Fred Bruce and Inspector George Brunton was unwavering and deeply appreciated.

Roberta G. Ferrence has served as research consultant on most phases of this project: analyzing data from the first phase; supervising the field staff during the second phase; analyzing data from the second phase; and preparing sections of the report to the Non-Medical Use of Drugs Directorate on which parts of this monograph are based. Dr. A. Ronald Gillis, also a research consultant, conducted some of the analysis of data. Doreen L. Whitehead, Administrative Associate, Whitehead Research Consultants Limited, administered the various projects that comprise this study.

I am immensely grateful to all these persons for their assistance, cooperation, and support.

London, 1977 P.C.W.

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CHAPTER I

THEORETICAL INTRODUCTION

This monograph is primarily about one type of consequence of lowering of the legal drinking age: collision involvement of young drivers. The practical interest in this topic is sufficient for it to warrant our attention and concern. However, there are theoretical and more far-reaching reasons why the questions to be addressed bear investigation.

The question of whether lowering the legal drinking age results in a change in the collision involvement of young drivers is intimately tied to one of the most important sets of issues in the field of studies on alcohol. The answer to the question has serious implications for (a) ascertaining the relative explanatory and predictive value of existing theories of alcoholism and (b) social policy relative to the prevention of alcohol-related damage experienced by individuals and society.

We have addressed some of these issues previously, but never before have we had an opportunity to detail in a single place the background of the current situation, the results of research and their implications. Readers are encouraged to review the original articles which are cited where appropriate. However, the main points from each will be described here, in order to have the record appear in a single place.

THE NOTION OF DAMAGE

Jellinek once said that the only things that all alcoholics have in common are "drinking and damage". This remains the most succinct statement as to the nature of the condition we call alcoholism or problem drinking. When we say that someone is an alcoholic or a problem drinker we mean that that person uses (drinks) alcoholic beverages to such an extent that it damages that person's functioning: economically, physically, socially or psychologically (cf., for example, World Health Organization, Expert Committee on Mental Health, Alcoholism Subcommittee, 1952; Seeley, 1959; Keller, 1962; Whitehead and Harvey, 1974). From epidemiological, sociological and social policy points of view one would like to know something about the types of conditions or circumstances that are apt to increase (or decrease) the likelihood of alcohol-related damage. Such knowledge would lead to an examination of the possibility or desirability of altering such conditions or circumstances in order to reduce the risk of high rates of damage.

There are many different ways of cataloguing the types of variables that may influence rates of alcohol-related damage. Straus (Drug Survival News, 1976) distinguishes between those that stem from the needs of the individual and those that stem from responding to one's environment ("social and cultural settings in which they drink"). Some of the "environmental" influences that are sociological have been specified by Bales (1946) who indicates that by creating needs for adjustment, fostering certain attitudes toward drinking and providing alternatives for the satisfaction of needs, social organization and culture can influence rates of alcoholism. Bales states these three "general ways" as follows:

1) the degree to which the culture operates to bring about acute needs for adjustment, or inner tensions, in its members;

2) the sort of attitudes toward drinking which the culture produces in its members; and

3) the degree to which the culture provides suitable substitute means of satisfaction (Bales, 1946).

Straus' categories allow for psychological and even genetic variables within the context of factors that are specific to the individual as well as for, sociological, economic and other variables as part of those factors that are external to the individual. The variables examined by Bales are sociological to the exclusion of psychological, economic and other considerations.

An analysis from the perspective of public health focuses on factors involving the "agent", "host" and "environment". The agent is the substance -- alcohol and its effects. The host factors are those that include psychological variables as well as genetic and other biological considerations that may be relevant. Environmental factors are the sociological, economic, political and other

considerations that are external to the individual, but not part of the substance. This framework has the advantage of being more general than that of Straus (which in turn is more general than Bales'), while distinguishing among three types of factors. Due to these reasons and the fact that the other two frameworks can be subsumed within it, we will employ the framework from public health. In addition, we will also use another distinction from the field of public health as a means of categorizing the broad strategies within which attempts are made to reduce the incidence or prevalence of certain phenomena. Attempts to reduce either the number of new cases of a condition during some specific period of time (incidence) or the total number of cases extant at some point in time (point prevalence) can be described as involving primary prevention, secondary prevention or tertiary prevention.

TYPES OF PREVENTION

Tertiary prevention involves the management -- we usually call it treatment -- of a condition that is full blown in order to bring about a cure, stabilization or the delay of death. Secondary prevention is dependent on early identification of either persons who have developed conditions or persons who are at high risk of developing or contracting a condition in order that they may be exposed to an intervention designed to ward off the condition to which they are susceptible or vulnerable. Primary prevention involves bringing about a change in the agent, host or environment in order that the likelihood or risk of a particular condition being developed is reduced. Such attempts may involve elimination of the agent in order that it is no longer a threat; inoculation of the host in order to make it immune or altering the environment in such a way as to reduce the likelihood of the agent and host coming together in such a way as to result in the undesired condition.

Tertiary prevention. Each of these types of prevention has potential applications to alcohol-related damage. Tertiary prevention involves an intervention that is administered to or done with the host. The intervention may take the form of trying to remedy, assuage, or cure some of the damage that has resulted from drinking such as cuts and bruises, liver cirrhosis, Korsakoff's psychosis, loss of jobs, breakdown of family relationships or it may attempt to "get at the root of the problem". However, the problem does not appear to have a single "root" and relatively little is known about the mechanisms that are involved in the etiology of alcoholism.

Secondary prevention. Secondary prevention requires early identification of persons whose drinking involves problems and where the damage is apt to get worse. Identifying "incipient alcoholism" among young people (e.g., Straus and Bacon, 1953; Park, 1962) and then subjecting such persons to an intervention that will lessen the likelihood that they will continue to behave in such a way that they will develop more advanced or more severe damage would be of this type. The case for the programmatic utility of secondary prevention of alcoholism damage has yet to be proved.

Two orientations have been suggested more than any others so they are worth mentioning here. Occupational programs of "constructive coercion" for alcoholic employees are sometimes described as involving secondary prevention because they supposedly involve early identification of "drinking problems". It may well be true that such programs might successfully coerce employees into treatment earlier than might otherwise be the case. But, the fact remains that the basis on which such coercion takes place is that it has already been successfully documented that drinking behaviours are interfering with the employee's performance at work (e.g., excessive absenteeism). Thus, treatment may be applied sooner, but not really to a condition that is in its earliest or incipient stages. Further, Smart's (1974a) examination of the conditions under which persons enter treatment indicates that those who are "coerced" do not fare any better in terms of drinking than those who seek treatment more voluntarily.

The second orientation involves an attempt to identify persons who are at high risk of later developing alcoholism problems. Identification can take place in behavioural or psychological terms.[1] Examples of studies that attempt to measure behavioural difficulties associated with

1. There are some well-known suggestions that identification can also take place in biological terms that may involve hereditary factors (Williams, 1946-1947) metabolism and vitamin deficiencies (Williams et al., 1949a) and other genotrophic factors (Williams et al., 1949b). However, little is known about the mechanisms involved in the pathological appetite for alcohol (Segovia-Requelme et al., 1971) and early identification and differentiation remains problematical (Cruz-Coke, 1971).

drinking include the studies of Straus and Bacon (1953) on drinking among college students where, among other things, they measure "social complications" of drinking such as loss of a job, accident, injury and arrest as well as other "warning signs" such as blackouts, drinking before breakfast and "participating when drinking in aggressive or wantonly destructive behaviour". Park (1962) used items from the data collected by Straus and Bacon and attempted to measure incipient alcoholism among these college students with the use of such items as solitary drinking, spree or bender drinking and "likes to be one or two drinks ahead without others knowing it".

Fillmore (1974; 1975) has reported results of a follow-up of some of the people in the original Straus and Bacon study twenty years later. She finds that some drinking patterns (e.g., frequent intoxication and problems associated with the use of alcoholic beverages, such as school-job problems) are associated with the manifestation of problems twenty years later. Some of the relationships are statistically significant and many appear to be theoretically meaningful, but the large differences between males and females and the moderate amount of variance explained, means that the findings are not apt to be programmatically relevant from the point of view of secondary prevention.

Psychological research provides even less basis for optimism. The best known body of psychological research that could have relevance for secondary prevention involves the search for the alcoholic personality or, more broadly, the addictive personality. We have previously reviewed the lack of success in identifying an addictive or alcoholic personality. We have gone further and indicated that even if one were identified it is unlikely that in a society such as ours it would be programmatically relevant. The original assessment (Whitehead, 1976a) warrants repeating here.

> *Alcoholics tend to be overrepresented or underrepresented relative to a variety of traits or characteristics. Some of these differences may comprise little more than "oddities" while others may be programmatically relevant. As Keller (1972) suggests, it is valuable to ascertain the differences among them.*
>
> *One of the main areas that has received attention but remained elusive is the search for the addictive personality. Next to the search for the Fountain of Youth and Captain Kidd's treasure, this must be one of the most frustrating exercises ever undertaken. On the basis of a review of all available literature published from 1936 to 1955, Syme (1957) concluded that "there is no warrant for concluding that persons of one type are more likely to become alcoholics than persons of another type". More than a decade later other researchers reiterate the same point: Mogar et al. (1970) conclude that:*
>
> > *the collective evidence fails to show that a particular kind of person is likely to become alcoholic. Research conducted thus far indicates clearly that individuals with a chronic drinking problem are not homogeneous with regard to personality. Instead, it seems likely that alcoholism is related to a number of different personality patterns; i.e., a variety of personal meanings and motives may be associated with excessive drinking.*
>
> *And, Skinner et al. (1974) find in their own work corroboration of previous findings (Goldstein and Linden, 1969; Partington and Johnson, 1969; Whitelock et al., 1971) of "several unique subgrounds ... within ... alcoholic patients"; in addition, they find an inability to classify almost half of the alcoholics into their eight bipolar typal dimensions (Skinner et al., 1974).*
>
> *A recent examination of the literature that might help to discern the psychological basis of drug dependence led Mott to the same conclusion relative to opiate addicts:*
>
> > *The present evidence does not suggest that a highly differentiated "addict personality" will be identified and the failure of previous attempts to differentiate other deviant-specific personality configurations such as the "delinquent personality" [or the alcoholic personality] make it seem unlikely (Mott, 1972).*

> *However, even if an addictive personality were identified, it is hardly clear that such a finding would be truly useful in the area of secondary prevention where its application would supposedly take place. Consider, for instance, a situation where adequate instrumentation were devised to correctly predict a future of addiction for 20 of 100 persons falling into an "addictive personality profile". The other 80 would, of course, be false positives. Positing a success rate of 20% might even be optimistically high. Nevertheless, the question is: How much and to what type of intervention are we willing to subject 100 persons in order to "save" 20 potential addicts? Should they be subjected to compulsory treatment on an inpatient or outpatient basis? The issues in question involve fundamental civil liberties and raise complex difficulties about the effects of the very process of labeling (Freidson, 1965; Lemert, 1967) wherein potential "addicts" and many more potential "normals" are successfully labeled and treated for the condition of "addictive personality". I believe that most societies are likely to refuse to tolerate so many false positives and may at least be ambivalent about very early intervention relative to any persons who have yet to manifest the behavioral aspects of the condition to which they are prone (Whitehead, 1976a).*

Hence, if there is a role for efforts directed at the secondary prevention of alcohol-related damage it has yet to be adequately specified and proven.

Primary prevention. It is in the area of the primary prevention of alcoholism problems that there exists the greatest promise and the greatest controversy. The current study of the impact of the lowering of the drinking age can help to reduce some of the controversy, since it addresses a major issue that is involved. Primary prevention of alcoholism could theoretically involve factors associated with the agent, host or environment. Practically speaking there really are no factors associated with this agent that do not in fact involve the host or the environment. Even elimination of the agent, in fact, involves the use of environmental factors to control it.

The host may be dealt with in ways that are analogous to inoculation in medical science. Rather than being physical, chemical or biological one can argue that the inoculation is social. This can take place in different ways. The host can be changed, modified or otherwise affected in such a way as to make it resist the use of alcoholic beverages as, for example, by being raised in an environment where abstinence is the norm. Alternatively, it is possible that one may be raised in a "wet" environment where one is taught to use alcoholic beverages in a manner that is not apt to result in problems. That manner, however, must involve the use of relatively small amounts of alcoholic beverages. As Beauchamp (1976) has pointed out so well, it is a myth to suggest that most people who use alcoholic beverages and do not experience problems associated with their consumption have somehow acquired a "skill" that other drinkers have not acquired. There is no evidence that persons learn to drink heavily in such a way as to experience no problems. Thus, the notion of inoculation has, at most, limited applicability. When it applies at all it is to situations where persons successfully internalize -- become socialized into -- norms that either proscribe the use of alcoholic beverages or prescribe only low levels of consumption.

In order to be effective, environmental factors must do something to either the host or agent or both. A social environment (culture) that contains many definitions favorable to the use of alcoholic beverages for a wide variety of purposes is likely to be characterized by widespread availability of alcoholic beverages and high rates of alcohol-related problems.

It is popular to characterize societies as more or less "wet" or "dry" depending on the availability of alcoholic beverages. However, it is certainly arguable that the "wetness" or "dryness" of a society in terms of availability is more a reflection of how "wet" or "dry" the culture is than vice versa. This certainly does not mean that the two are always congruent. They need not be so, and in many cases they are not. For instance, prohibitionist sentiments (attitudes) grew in strength in a society that was wet in terms of availability and repeal sentiments made their way in a society where availability was considerably reduced. These shifts in the structure of attitude of societies and in the legal structure of societies are found not only with respect to alcoholic beverages, but relative to many other aspects of social life as well.

THEORETICAL FRAMEWORKS OF PREVENTION

The current study of the impact of lowering the legal drinking age can help to reduce some controversy since it addresses a major issue that is involved in understanding (explaining) and preventing alcohol-related damage. First, however, the nature of the controversy needs to be identified. We have dealt with these questions previously (Whitehead and Harvey, 1974; Whitehead, 1975a, 1976b), but there is a need to do so once again since the main points have been either ignored or badly understood. There are two major schools of thought on how the etiology of alcohol-related damage can best be understood at the macro level. Both of these take essentially an epidemiological approach to the question of what factors seem to account for differences in rates of alcohol-related damage in different social groups.

Socio-cultural. The best known and most popular school of thought is the socio-cultural model, which is based primarily on anthropological (see, for example, Horton, 1943; Field, 1962) and sociological (see, for example, Bales, 1944, 1946, 1962; Sadoun et al., 1965; Skolnick, 1958; Snyder, 1958, 1962; Straus and Bacon, 1953) studies that attempt to account for the patterns of drinking and rates of alcohol-related damage in different societies. For the most part, the emphasis has been on the structural aspects of social norms concerning drinking, but attention has also been paid to the social meanings of the use of alcoholic beverages in different social groups as well as the content of the norms.[2]

Various attempts have been made to develop propositions that might account for why a particular group, such as Orthodox Jews, has a low rate of alcohol-related damage (Snyder, 1962) or why another group, such as the Irish, seems to have a high rate of alcohol-related damage (Bales, 1944). Some studies contrast the rates of different social groups such as the Jews and the Irish (Bales, 1962; Snyder, 1962) and attempt to account for differences in rates of damage in terms of the differences in patterns of socialization into the use of alcoholic beverages. Others have attempted to synthesize the propositions that account for the differences in alcohol-related problems across collectivities. The most comprehensive statement along these lines is the hypothesis that was first formulated by Ullman (1958) and later amended by Blacker (1966). This hypothesis focuses on both the content and structural aspects of social norms:

> *... in any groups or society in which drinking customs, values and sanctions--together with the attitudes of all segments of the group or society are well established, known to and agreed upon by all, consistent with the rest of the culture, and are characterized by prescriptions for moderate drinking and proscriptions against excessive drinking, the rate of alcoholism will be low (Blacker, 1966).*[3]

This hypothesis reflects the basis for specific suggestions as well as programmatic approaches for the prevention of alcohol-related damage (see, for example, Plaut, 1967; Wilkinson, 1970). The essence of the proposals that stem from the socio-cultural approach to explaining and preventing alcohol-related damage is that the use of alcoholic beverages must be made an integrated part of social life and not treated as something that is special,[4] deviant, unusual, hidden or otherwise restricted. Adherents to this approach would, among other things, favour the lowering of minimum age laws for the purchase and consumption of alcoholic beverages (Wilkinson, 1970) and in some cases even doing away with them altogether (Chafetz, 1965; Plaut, 1967).

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2. For a provocative discussion of the concept of "ambivalence" that is part of many of these formulations see Room (1976). However, the notion of "ambivalence", is not a central part of the issues that concern us here.

3. Italics indicate Blacker's amendment to the Ullman hypothesis.

4. Straus (1966), for instance, asserts that "legal restrictions against drinking before the age of 21 continue to serve to enhance the symbolic status of drinking for the teenager".

Distribution of consumption. The second major school of thought on this topic can be called the distribution of consumption model. The line of investigation on which it is based began with the work of Ledermann (1956) in the 1950's. It was later picked up by Seeley (1960) and has been pursued most aggressively by de Lint, Schmidt and Popham (de Lint and Schmidt, 1968; 1971a; Popham et al., 1976a; 1976b). This body of research indicates that there is a positive relationship between the overall level of consumption of alcoholic beverages (usually expressed in terms of per capita consumption of absolute alcohol among persons over the age of fifteen) and incidence of alcohol-related problems as reflected in rates of death from cirrhosis of the liver (de Lint and Schmidt, 1971b). It also indicates that the availability and accessibility of alcoholic beverages are positively associated with the level of consumption. For instance, economic accessibility appears to be a critical factor (Popham et al., 1976b) as does increased availability in some circumstances, such as in Finland when the number of outlets was allowed to increase very rapidly (Mäkelä, 1972). However, there are some other circumstances when changes in control measures that may involve increased availability do not appear to result in increased rates of alcohol-related damage. Assessing the impact of many of these changes is difficult for three reasons (Whitehead, 1976b). First, changes in alcohol and other control measures tend to be small rather than marked changes; second, it is not unusual for changes in control measures to follow changes that have already taken place in behaviour; and third, changes in control measures are frequently made as part of a package of changes so it may not be possible to discern which change produced which effect.

PURPOSE OF THIS STUDY

The case of lowering of the drinking age presents an opportunity to test the relative validity of the predictions that can be made from the socio-cultural and distribution of consumption models. We previously engaged in a test of these models using already published and coded data (cf.,Bacon et al., 1965) on scores of preliterate-non-western societies (Whitehead and Harvey, 1974). That study indicated that, given the operationalizations that were possible of the variables contained in the Ullman-Blacker formulation, a statistically significant part of the variance in level of alcohol-related problems was explained by the level of integration of drinking practices. In contrast, twice the amount of variance was accounted for by a single variable, the general level of consumption. Thus, there appears to be some validity to both models with the distribution of consumption model being the one with the better record of prediction (Whitehead and Harvey, 1974).

Relative to the lowering of the legal drinking age the socio-cultural model leads us to predict that a change in this control measure would result possibly in a decrease,[5] but certainly not an increase in alcohol-related damage since the availability of alcoholic beverages would mean that this was no longer a "forbidden fruit" to young people between the ages of 18 to 20. The distribution of consumption model leads to a prediction of an increase of alcohol-related damage because the lowering of the drinking age means an increased availability of alcoholic beverages to young people. In many ways this is a better test of the two frameworks than the one described earlier because it measures change rather than being a static analysis of a number of groups or societies at a single point in time (cf., Room, 1972).

We have chosen to examine the impact of the lowering of the drinking age on the collision involvement of young drivers for three reasons. First, the question of whether there is a measurable impact is of interest to people and organizations in many sectors of our society whether it has broader theoretical relevance or not. Second, traffic collisions constitute an unequivocal measure of alcohol-related damage. If the number or severity of collisions increases, few persons will argue that this does not constitute measure of alcohol-related damage. In contrast, if one assessed the impact on drinking, for example, it could be argued that the implications in terms of damage are nonexistent, un-proven or un-specified. Third, records on collision involvement have been kept on a routine basis for many years and access to this information is possible in a valid and reliable manner. Therefore, we have a situation where issues that are relevant to public policy in the areas of alcohol control measures and traffic safety can be addressed at both an empirical and

5. Straus (1966) says that "...once drinking becomes legally permissible, it may become somewhat less important".

theoretical level. Based on the inferences from this study, recommendations for public policy may be formulated relative to specific issues involved in traffic safety and more general issues concerning the primary prevention of alcohol-related damage through environmental controls of factors involving the agent and host of such damage.

CHAPTER II

REVIEW OF THE LITERATURE: LOWERING THE DRINKING AGE

Until 1970 only a few jurisdictions in North America have permitted people under the age of twenty-one to legally purchase all types of alcoholic beverages; the province of Quebec (Information Review, 1976) had a legal drinking age of twenty and the states of New York and Louisiana had a drinking age of eighteen. A small number of states made provisions for some types of beverages to be legally purchased and consumed at younger ages than others: North Carolina and West Virginia allowed beer to eighteen-year-olds, but prohibited wine and spirits until the age of twenty-one; Idaho permitted beer at twenty, but wine and spirits at twenty-one; and Colorado, Kansas, Ohio, South Dakota, Virginia and West Virginia had a drinking age of twenty-one, except for beer under 3.2% alcohol which was allowed to eighteen-year-olds (Kelley, 1964).

Between 1970 and 1973, half of the United States, all the ten Canadian provinces and the Yukon and Northwest Territories lowered the legal drinking age. Delaware lowered the drinking age to twenty and the following states lowered it to nineteen: Alaska, Arizona, Idaho, Nebraska and Wyoming. Eighteen became the legal drinking age in the following states: Connecticut, Florida, Georgia, Hawaii, Iowa, Maine, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, Rhode Island, Tennessee, Texas, Vermont, West Virginia and Wisconsin (Alcohol and Health Notes, 1973). In Canada, the drinking age was lowered to nineteen in Newfoundland, Nova Scotia, New Brunswick, British Columbia, Yukon and Northwest Territories and to eighteen in Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan and Alberta (Information Review, 1976).

It is not possible to clearly delineate the precise reasons why the legal drinking age was lowered, but we can appreciate some of the circumstances that prevailed at the time and some that preceded it. There was, at the turn of the decade, a mood that was highly favourable to enfranchisement of eighteen-year-olds, possibly due to some degree of guilt over involvement in Viet Nam and concern about perceived disaffiliation and rebelliousness among young people. Allowing eighteen-year-olds to vote was a possible way of attracting them to the mainstream political process. Allowing young people to enter into legal contracts and lowering the legal drinking age were seen as less important issues, but as something that ought to be done in order to be consistent. These steps were defined as progressive and not opposed in any organized way.

Suggestions to lower the legal drinking age were not new; in fact, such recommendations had been strongly advocated by influential persons who held positions of prestige and power. In 1967 Thomas F.A. Plaut prepared the report of the Cooperative Commission on the Study of Alcoholism titled Alcohol Problems: A Report to the Nation that called for a removal of restrictions based on age. Furthermore, it suggested a reduction of the legal drinking age to eighteen as a first step in this "transition":

> *...In principle, all age restrictions for alcohol probably should be eliminated, but this would probably be too precipitous a change... Perhaps, during a transitional period, while other changes are occurring in American drinking patterns, a minimum age of 18 for public drinking or purchase might be adopted (Plaut, 1967).*

Rupurt Wilkinson (1970) reviewed the same evidence as the Cooperative Commission, in fact he worked for it between 1962 and 1966, and came to similar conclusions that he published independently of the Commission. He called for lowering of the legal drinking age to 18 years for the purchase of alcoholic beverages and for the elimination of all age restrictions for drinking at home and at dances and parties where there is parental supervision.

These are but echoes of Chafetz's (1965) "Let's get rid of the age limit for drinking" (emphasis as in original). He is unequivocal and does not suggest that if done it should be part of a larger programme of changes. He sees it as a beneficial change in and of itself. Chafetz was later named the first Director of the National Institute on Alcoholism and Alcohol Abuse, a post he held for five years, throughout the early 1970's, which (coincidentally?) is the period when the drinking age was lowered.

At the time when age of majority legislation was introduced and passed, lowering the age for voting appears to have been viewed as more socially and politically significant than the lowering of the drinking age. Most of the changes occurred shortly before elections in the jurisdictions affected. In terms of research, relatively little attention has been paid to studying the impact of lowering the age for voting and entering into binding contracts.[1] In contrast, a number of studies have appeared that attempt to evaluate the effect of lowering the legal drinking age. In order for adequate assessments of the impact of such measures, data covering a number of years are required. It is therefore not surprising that studies have begun to appear only in the past few years.

MEASUREMENT AND DESIGN

The most serious problem usually associated with drinking and driving is the automobile collision. Collisions may involve only property damage or they may result in injury or even death for the occupants and others. Data on collisions are routinely collected, independently of the needs of scientists. For these reasons, studies of the impact of the change in the drinking age generally use measures associated with collisions rather than impairment as the dependent variable.[2] These measures are of two kinds. The first is the type of damage associated with the collision: property damage, personal injury, or fatal. The second is whether alcohol is involved. There is an array of criteria for alcohol involvement: the legal limit for blood alcohol concentration; some lower limit; or the investigating officer's opinion of whether the driver had been drinking or was impaired. Other techniques that produce estimates of the population that drives while impaired may also be employed. For example, separate analyses may be carried out for collisions that occur at night when a larger proportion of drivers have been drinking.

The researcher who attempts to study the effect of the change in the drinking age, is confronted with a number of problems in measurement. Collisions involving all types of damage constitute the largest category of events that can be studied and they are less subject to influence by factors that might affect only certain types of collisions. For example increases in the wearing of seat belts may reduce fatal collisions, but would probably not change the total number of collisions. On the other hand, the incidence of fatal collisions is less subject to errors involved in reporting than collisions involving only property damage. This is because minor collisions are not always reported. A disadvantage of restricting the analysis to fatal collisions is that the testing of blood alcohol levels of drivers killed in collisions probably involves greater inaccuracy than breath testing of live drivers.

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1. For an exception to this, see Bowen and Kagay (1973).

2. A very recent study attempted to assess the impact of lowering the drinking age by examining records of crashes involving fatally injured young drivers on whom blood tests were conducted in Alberta, Saskatchewan, Manitoba and New Brunswick (Warren et al., 1977). The conclusion of the study was that there was "no substantive impact". In a great many respects, some of them acknowledged by the authors, the study constitutes a less than adequate test of the hypothesis at hand. A detailed discussion of this study is not possible at this time. However, some of its fundamental limitations are the following. First, only fatal crashes are examined and they constitute quite rare events in the four years examined so there is a fair amount of year-to-year variability that makes it difficult to fit appropriate trend lines. Second, because the events are rare, the number of events (fatal crashes) in individual years is quite small (frequently under 25 and seldom over 50). Third, even these small numbers of events are inflated by the inclusion of categories of drivers that are less likely to have been immediately affected by the lowering of the drinking age (16 and 17-year-old males and 16 to 20-year-old females) than males between the ages of eighteen and twenty. Hence, the extremely limited number of cases makes it impossible to engage in a critical test of the hypothesis which would involve an examination of 18 and 19-year-old male drivers during the hours of 9:00 p.m. to 3:00 a.m.

Measurement of the "condition of the driver" has been the subject of some controversy (see Zylman, 1974). The labeling of cases as "alcohol-related" on the basis of subjective reports by police may result in an inflated estimate of alcohol involvement, but this has yet to be clearly demonstrated. The use of more objective surrogate measures (cf., Douglass et al., 1974) can serve as a test of validity of the subjective reports, but when used alone they may substantially reduce the measurable impact of the change in the law. Comprehensive breath testing of all drivers involved in collisions would eliminate many of the problems associated with the measurement of alcohol-related collisions, but the practice is not in effect anywhere and it would be so expensive as to be prohibitive.

All jurisdictions know when the change in the drinking age officially took effect.[3] However, measuring the time of the change in the law is sometimes complicated by the form in which data on collisions are available. In some studies, only annual data are available so that rough approximations must be used.

Similar difficulties may arise relative to the age of drivers involved in collisions. In some cases, data may be grouped in such a way that drivers who are less than 18 or more than 20 are included with those aged 18 to 20. Problems arising from the form in which the data are available are generally resolved in such a way as to obscure or mask a real effect of the change in the law rather than lead to an inference that an effect took place when there actually was none.

Evaluations of the impact of changes in a particular law on behaviour may use any of a number of different research designs. The question one wishes to address is simple enough, but the circumstances within which the answer must be sought are complex. In assessing whether the lowering of the drinking age contributed to higher rates of alcohol-related collisions among young drivers, it is not sufficient to merely observe higher rates of collisions after the change in the drinking age than was the case before. One must also examine whether what Campbell and Stanley (1963) call other reasonable rival hypotheses might account as well for an observed change in rates of collisions. Hence, in order to be able to make inferences about the impact of the lowering of the drinking age, fairly sophisticated designs are usually necessary. The type of design that has been used in most studies of the effect of the change in the drinking age on the collision behaviour of young drivers is a multiple time series design (Campbell and Stanley, 1963). The basic design involves periodic measurement of the incidence of collisions both before and after the change in the law. Data are also collected for a non-equivalent "control" group (perhaps better called a comparison group) that has not been exposed to the change in the law. In a true experiment, the change in the drinking age would occur randomly among different jurisdictions so that selection biases are controlled. Because this is not possible in a quasi-experiment, some studies have tried to decrease this potential source of bias by using a number of paired jurisdictions with and without the change in the law, rather than a single area with one control. A variation of this design uses age categories that are not affected by the change in the law as non-equivalent comparison groups. Data for these comparison groups are readily available and factors that might vary from one jurisdiction to another can thereby be controlled.

Both types of non-equivalent control groups would be rather inadequate in the context of a simple pre-post test design. But, when they are combined with the interrupted time series, sources of internal validity are controlled so that this particular quasi-experimental design may justifiably be termed "excellent" (Campbell and Stanley, 1963).

In our review of the literature, a number of criteria that relate to both the design and the analysis will be applied in assessing the value of particular studies. Those relating to the design are as follows:

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3. For the exact dates in Canada, see Information Review, (1976) and the United States, see Alcohol and Health Notes (1973).

1) Studies that have used the multiple time series design, which includes at least one non-equivalent control group, will be given the greatest weight;

2) A change in the drinking age that includes all types of alcoholic beverages is critical; and

3) Those studies that provide convincing evidence that factors affecting the inclusion of cases do not vary between (quasi-) experimental and comparison groups will be given greater weight.

The failure of a particular study to meet any one of these three criteria seriously undermines our confidence in the conclusions of that investigation. However, the first criterion is the most important.

There are three additional factors relating to design that will also influence our assessment, but these are less critical than the preceding three:

1) The extent to which the population of collisions used is comprehensive: that is, whether it includes only fatal collisions; only total collisions, or all three types of collisions (property damage, personal injury or fatal);

2) The use of data in which the age categories correspond closely to those affected by the legal changes; and

3) The use of data that permit a division of the time series that closely corresponds to the time of the change in the law.

Additional criteria that could be applied to any particular analysis of data on collisions are dictated by the strengths and weaknesses of the design chosen and by the nature of the data that are available. The most important consideration is that the investigator appropriately analyzes the data at hand. The extent to which this has been done satisfactorily will be discussed within the context of evaluating specific studies.

The literature on the impact of the change in the drinking age consists of studies carried out in the United States and Canada; some involve comparisons between adjacent jurisdictions in the two countries.

RESEARCH IN THE UNITED STATES

Early data on the Michigan experience are reported by Hammond (1973). Michigan State Police statistics for 1972 indicate an increase of 119 percent in alcohol-related collisions among 18 to 20-year-olds following the change in the law at the beginning of that year; the comparable increase for all other drivers was only 14 percent. Similar patterns were found for personal injury and fatal collisions and also for arrests for Driving Under the Influence of Liquor (DUIL). What is of interest here, is that the ratio of the percentage increases in alcohol-related collisions among young drivers to older drivers was more than 8:1, whereas the ratio for DUIL arrests was somewhat lower at less than 6:1. If it were true that the police were more likely to charge a larger proportion of young drivers who contravene the law than previously, we would expect higher -- rather than lower -- ratios for DUIL arrests compared to actual collisions.

Further support for this conclusion emerges from a series of roadside surveys in Michigan involving the random administration of the breathalizer test (Hammond, 1973). The size of the 16 to 20-year-old age group with elevated BAC levels (over .05 percent) is small, but analysis indicates that this was the only category that experienced a statistically significant increase in impairment.

This study does not utilize a true time series design, but has used older drivers as a comparison group. The inclusion of data for DUIL arrests attests to the reliability of the data based on police reports. The inclusion of drivers involved in several types of collisions adds to the credibility of the findings. However, the limitations of the pre-post test design mean that the results of this study must be considered preliminary and inconclusive though they are of heuristic value.

More extensive information on the situation in Michigan is reported by the Michigan Council on Alcohol Problems (MICAP RECAP, 1973). These data consist of a limited annual time series covering three six-month periods (January to June), the first during the year prior to the change in the law and the second and third in the first and second years following it. Alcohol-related fatal collisions involving 18 to 20-year-old drivers, both male and female combined, are compared with alcohol-related fatal collisions for all other drivers. More limited data are presented for alcohol-related injury and property damage collisions.

Among drivers aged 21 and over, alcohol-related fatal collisions increase in a uniform fashion, by 9 percent in the first six-month period following the change and by 8 percent the following year. In contrast, 18 to 20-year-olds manifest an 88 percent increase during the first six months after the change in the law. By the following year, the rate of increase returned to 13 percent, which is probably its usual magnitude. The disparities are greater for collisions where there is personal injury and larger still for cases involving property damage.

While this study would have benefited from a more extended time series, the consistent increases in all three types of collisions that occur during the first year after the change in the law and the subsequent levelling off during the following year do offer support for the hypothesis that the change in the law had an effect on collision involvement. The only serious reservation is the exclusive reliance on police reports of alcohol involvement. This is somewhat alleviated, however, by the existence of objectively derived data, for the State of Michigan (Hammond, 1973), that indicate a real increase in impairment among young drivers.

Richard Zylman (1974) is one of the few researchers who claim support for a reporting hypothesis as an explanation for the reported increase in crashes among young drivers. He agrees that there was an abrupt increase in rates of alcohol-related collisions among 18-20-year-olds following the change in the law, but contends that this is largely the result of increased pressures on the police to report alcohol involvement among young drivers involved in collisions.

Zylman presents a single time series of the number of drivers aged 18 and 19 involved in fatal crashes in Michigan between 1962 and 1972. On the basis of variations in the annual percentage change, he concludes that these likely constitute normal year-to-year fluctuations. He also compares the percentage change in alcohol-involved and total fatal crashes among 18 to 20-year-olds for the first nine months of 1971, 1972 and 1973 and suggests that only comparable percentage increases would support the argument that the change in the law produced the observed effect.

There are a number of serious problems with both the design Zylman has used and his method of analysis. The least serious difficulties with the design are the exclusion of 20-year-olds from the extended time series (official data for 20-year-olds are combined with 21 to 24-year-olds) and the fact that only fatal crashes are included. The most serious fault in the design is the failure to use a non-equivalent comparison group. As Campbell and Stanley (1963) emphasize, the greatest weakness of the single time series is the failure to control history. The introduction of a second time series describing changes in the incidence of fatal collisions among drivers over the age of 20 would allow stronger inferences about the annual fluctuations that Zylman reports for 18 and 19-year-olds.

Issues relating to Zylman's analysis of data have been detailed previously (Ferrence and Whitehead, 1975). The slight positive increase in alcohol-involved fatal collisions during the second year following the change in the law is not, as Zylman claims, evidence of a decline in reported alcohol-involvement arising from decreasing interest on the part of the police. Rather, it is consistent with what one would expect: maintenance of the previous increase without further increases beyond the usual amount.

The same article rejects Zylman's contention that total crashes should increase at the same rate as those that are alcohol-involved if there is a real effect of the change in the law. According to Zylman, if alcohol-related collisions increase by, for example, 20 percent because of the lowering of the drinking age, then total collisions must also increase by 20 percent. This is simply not the case because alcohol-related collisions are only a small proportion of total collisions (Ferrence and Whitehead, 1975). The pattern of increases expected by Zylman if the change in the

law had an effect is exactly one of the kinds of patterns that one could expect if there had been no real effect of the change in the law. The "reporting hypothesis" would be most strongly affirmed by findings characterized by an increase in alcohol-related fatal crashes relative to total crashes with no change in the total incidence of crashes. On the other hand, the inference of a causal relationship would be based on the same disproportionate percentage increase with the difference that there would be a numerical increase in total collisions sufficient to account for the numerical increase in alcohol-related collisions. Since this is precisely what Zylman's data look like, we cannot conclude that his research seriously challenges those findings discussed previously.

Zylman's (1975) attempt to reply to his critics does not undermine the logic and substance of their arguments. He constructs a hypothetical example in which total collisions increase from 100 to 300 over two years, an increase of 200 percent, whereas alcohol-related collisions rise from 3 to 27 for an increase of 800 percent. He then suggests that it it unlikely that the small numerical increase in alcohol-related collisions "caused" the much larger increase in total collisions. This is obviously correct. However, these hypothetical data remain supportive of the causal hypothesis inasmuch as the change in the law would theoretically result in 24 of the 200 additional collisions. Clearly, it would require other factors to account for the remainder of the unusually large increase in total collisions that he hypothesizes.

Zylman's (1975) argument that the subjective observations made by the police are too inaccurate for use is nowhere supported by evidence that they actually did overreport cases involving alcohol among young drivers following the change in the law. His own documentation of reporting inconsistencies in police records does not suggest such systematic irregularities as these (Zylman and Bacon, 1968). Furthermore, we have previously mentioned the roadside breath tests that were carried out in Michigan (Hammond, 1973) and the fact that these provide objective support for a real increase in drinking and driving among young drivers.

Finally, in his response, Zylman (1975) provides time series data for 1973, which he claims offer additional support for the position that the increases in 1972 reflect normal fluctuations. This does not appear to be the case. Aside from a rather sizable decrease in 1967, the pattern of the time series is one of large annual increases in fatal collisions until 1968, when the incidence levels off and begins to decrease. This decrease is found in each year after 1969 with the exception of 1972, the year when the drinking age was lowered. A comparison group would make this pattern far easier to interpret. Nevertheless, this pattern certainly does not suggest a series of random fluctuations. Fortunately, in order to understand the situation in Michigan, we are not completely dependent on Zylman's analysis and interpretation.

Williams et al. (1975) also studied the effect of lowering the drinking age on fatal crashes. However, in this study a much superior design, the multiple time series, is employed. The time series encompasses three years prior to and one year following the change in the law for three areas where the drinking age was reduced and three areas where it was not. Michigan, Wisconsin and Ontario, Canada reduced the drinking age between 1971 and 1972. These jurisdictions are compared with Indiana, Illinois and Minnesota where the age remained unchanged, during the period being studied. Statistical comparisons are made using the number of 15 to 17-year-old and 18 to 20-year-old drivers involved in fatal crashes in areas that changed the law, divided by the sum of the total number of crashes in the change area and the comparison area.

Results indicate a significant, but not large, increase in the test statistic for both age groups following the change in the law. When crashes that are more likely to involve alcohol are examined separately, namely nighttime and single vehicle collisions, even larger increases are noted.[4] Michigan and Ontario each experienced an excess of fatal crashes that is more than double the excess for Wisconsin. (Wisconsin, in fact, constitutes a special case for reasons that are discussed below.) Williams et al. (1975) conclude that there is evidence for an effect of the change in the law, but that it appears to be somewhat less than more subjective reports would indicate.

4. Comparisons of border areas of change and non-change were conducted in order to test for a "spillover effect", but there were no apparent differences.

They also suggest that the law may in fact have influenced reporting practices more than it did the actual rate of fatal crashes, but they do not doubt that the law had a real impact on the rate of fatal crashes.

While this study uses a fairly sophisticated design, there are still certain difficulties with it. The requirement that the change in the law apply to all alcoholic beverages is not met in all cases. Among the states that changed the legal drinking age, Wisconsin already permitted the sale of beer to 18-year-olds prior to the change in the law. This may account for the somewhat smaller excess of collisions noted for that state. Among the comparison states, Illinois permitted the use of alcohol by minors in the home, Indiana allowed those under 21 to drink alcoholic beverages if accompanied by a parent and Minnesota permitted both home use of all alcohol and the consumption of 3.2 percent beer in the company of a parent or guardian. These regulations could only minimize the effect of the change in the drinking age on fatal or other crashes and make jurisdictions that have them, poor comparisons for purposes of evaluation.

The use of nighttime and single-vehicle collisions to approximate alcohol involvement indicates a serious attempt to deal with the problem of variations in reporting. Such variations are inevitable when several jurisdictions are included in the analysis. However, a much closer approximation would have resulted if these two factors were combined (cf., Douglass et al., 1974). In their analysis, Williams et al. (1975) do not clearly indicate that the measures they use substantially reduce the apparent effect of the change in the law. Furthermore, the particular test statistic used may show increases that appear smaller than those found in studies using different methods of analysis. Only fatal collisions are included so the opportunity to test the hypothesis on other types of collisions is foregone.

The findings of Williams et al. (1975) suggest a limited, but significant, impact of the change in the law. With the exception of the use of Wisconsin as a control state there are no major problems with the design. However, the controls that are used and the measures of alcohol involvement employed have probably resulted in excessively conservative estimates of the impact of lowering the drinking age.

The use of data for a state that did not experience a clear change in the drinking age had more serious consequences for Naor and Nashold (1975). They studied fatal collisions among young drivers in Wisconsin following the extension of the availability of alcoholic beverages for 18 to 20-year-olds in March, 1972, from beer only to all types of beverages. These researchers employ a multiple time series design that compares young drivers with drivers aged 21 and over for a period of slightly more than five years prior to the change in the law and a twenty-one month period following the change.

As a measure of alcohol involvement, the blood alcohol concentration (BAC) of fatally injured drivers is used. Such testing is mandatory for drivers in fatal collisions, but in fact, only 75 percent are actually tested. Sixty percent of the 18 to 20-year-old drivers tested had BAC levels greater than .05 percent. Chi square analyses were performed using the proportion of alcohol-related collisions of all tested collisions over the six-year test period. Calculations were performed using both the .05 percent level and the .01 percent level to indicate alcohol involvement.

On the basis of this analysis, Naor and Nashold (1975) report that 18 to 20-year-old drivers were not involved in a significantly greater proportion of alcohol-involved fatal collisions following the change in the law than were other age groups. Although the number of alcohol-related fatalities did increase substantially for this age group, the proportion of all cases tested did not.[5]

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5. If the "reporting hypothesis" were correct we would expect to find an increase in the proportion of young drivers involved in fatal crashes to be tested.

Cursory examination of this study and the authors' own conclusions indicate that this study fails to support the hypothesis of an effect of the change in the law on the collision behaviour of young drivers. However, closer examination clearly reveals a major flaw in this study that makes it an inadequate test of the hypothesis at hand. In addition, there are a number of more minor considerations that would impair inferences from this study even if it were not plagued by its fatal flaw.

The major problem in the study by Naor and Nashold (1975) is that their design allows for an extremely plausible hypothesis that rivals the conclusion that the change in the drinking age had no impact on the collision behaviour of young people. In Wisconsin, prior to the change in the law, 18 to 20-year-olds could already legally purchase and consume beer, the most popular beverage among young people. Approximately 70 percent of the consumption of alcohol by 18 to 20-year-olds consists of beer, even in those areas where the change in the drinking age is not beverage specific (Alcohol Health and Research World, 1975). This percentage is likely to be even higher in an area such as Wisconsin where the preference for beer was previously reinforced by legislation. Given this pattern, one would not expect a very sizable -- if any -- increase in alcohol-related collisions as a result of increasing the availability of alcoholic beverages other than beer.

Thus, this study fails to meet one of the major criteria that we have specified, namely that the legal change include all types of alcoholic beverages. Other deficiencies[6] pale by comparison.

A more satisfactory investigation of a single state was carried out by Cucchiaro et al. (1974) in Massachusetts where the drinking age was lowered in March, 1973. This study uses an interrupted multiple time series analysis of adjusted monthly data covering the period January, 1969 to September, 1973. Analyses are performed for three types of collisions and for four age groups: drivers under 18, aged 18 to 20, 21 to 23, and 24 and over, as well as for all ages combined. Adjustments to the data control for mileage and seasonality and the incidence of collisions for the group over the age of 23 is used in a ratio with that of the other age groups to control for other factors. Alcohol involvement includes citations for "operating under the influence", that is, with a blood alcohol concentration in the excess of .1 percent, and "operating after drinking" where the operator admits drinking, but has a blood alcohol concentration that is lower than .1 percent.

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6. These other problems are mentioned here for the purpose of providing a complete record:

   a) The small numbers of fatal collisions are problematical. For example, Noar and Nashold (1975) are unable to fully analyze the data for 16 and 17-year-olds because of this. Even for 18 and 20-year-olds, the total number of drivers tested in any one year is usually less than 100. The incidence of fatal collisions may also be a less sensitive indicator of the effect of external factors than would the incidence of total collisions.

   b) There are difficulties with the nature of the actual data and the type of analysis employed. The comparisons that are made involve the proportion of alcohol-involved fatal collisions of all those tested rather than the total incidence. Since 25 percent of driver fatalities are not tested, we are left to wonder about the condition of the persons in this category. The authors do note that cases where alcohol is assumed not to be involved are probably less likely to be tested, but we cannot tell about any changes that might have occurred. During the first full year following the change in the law, the incidence of alcohol-related fatal collisions among drivers aged 18 to 20 increased almost 60 percent. Increases among other age groups were considerably lower, about 30 percent for 21 to 24-year-olds, 14 percent for those over 44 and there were decreases for all other age groups. The authors emphasize that despite the larger increases among 18 to 20-year-olds in both alcohol-related and total tested collisions, the proportion of alcohol-related to total tested did not change appreciably. Since most of those tested (72 percent) showed evidence of at least low levels of alcohol consumption, this is not surprising. More useful data would be ratios of alcohol-related to total collisions, regardless of testing.

Significant increases in collisions following the change in the law are reported for the following categories: total alcohol-related fatal collisions; total alcohol-related property damage collisions; and total fatalities among 18 to 20-year-olds calculated with and without the control group. No increases are found for total alcohol-related personal injury collisions, total fatal collisions, and fatalities among the older age groups (Cucchiaro et al., 1974).

These results support the hypothesis that lowering the drinking age increased the incidence of alcohol-related collisions among 18 to 20-year-old drivers. Increases range from 24 percent for property damage collisions to 75 percent for fatal crashes. These data on collision involvement are also likely to be the most complete and reliable because of the potential variability that exists in practices of issuing citations. The authors conclude that as a result of the change in the law, the drinking and driving patterns of 18 to 20-year-olds have become much like those of older drivers.

Cucchiaro et al. (1974) are somewhat restricted in their analysis by certain factors that are beyond their control: the six-month post-law period is relatively short; implementation of no-fault insurance limits the usefulness of data on personal injury and property damage; and they must rely on drinking-related citations, which are subject to bias. This last difficulty is the only one that involves a failure to meet one of the three major criteria. However, the authors have satisfactorily dealt with each of these problems. To examine the subjectivity of police citations, the authors compare the police reports for fatal crashes with the results of State Police lab tests for blood alcohol content levels carried out on fatally injured drivers. Similar increases are noted for both methods of assessing alcohol involvement. This suggests that the data on citations may not be seriously biased and that the inferences based on these data are warranted.

Perhaps the most sophisticated study of the impact of the change in the drinking age was carried out at the University of Michigan, Highway Safety Research Institute (Douglass et al., 1974). These researchers use a multiple time series design that involves two types of non-equivalent control groups: four states that did not experience a change in legislation, and drivers aged 21 to 45 who were also unaffected. The time series for three of the seven states extends from a point four years prior to the legal change to one year following it. The shortest time series is for only a single year before and after the change in legislation. However, the use of monthly rather than yearly data permits time series analyses to be performed.

In addition to the subjective police reports of alcohol involvement, a three factor surrogate measure is used to provide a more objective form of the dependent variable. Single vehicle collisions that occur late at night and involve male drivers show a fairly strong association with alcohol-involvement (53 percent to 66 percent) so that these cases are used as a separate measure as well as those classified as "had been drinking". There are a number of advantages associated with using both types of measures. The objective surrogate measure controls for reporting factors. The more subjective reports by police are unlikely to include false positives so that in this sense, they are a more valid measure of alcohol involvement. The inclusion of both measures means that variations among jurisdictions and the accuracy of the subjective measure can be assessed by comparing the two.

On the basis of the time series analyses, Douglass et al. (1974) conclude that increases in alcohol-related crashes among young drivers, which are "statistically and socially significant", occur in two of the three experimental states and in none of the control states. These increases are greatest in Michigan and slightly less in Maine, but do not occur at all in Vermont. The states of Pennsylvania and Texas, which did not undergo a change in the law are unaffected, as are New York and Louisiana, where the drinking age was lowered some years ago.[7]

The authors also investigate the age-specific frequency distributions of alcohol-related collisions among drivers under the age of 24. Prior to the change in the drinking age, O'Day (1970) had noted that the age distribution of young drivers involved in collisions was bimodal with peaks at about ages 18 and 21. Separate plotting of alcohol-related and other collisions reveals that the incidence for the former group peaked at age 21, the drinking age at that time, whereas for the latter it was greatest at about age 18. Douglass et al. (1974) plot the three-factor surrogate

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7. The legal drinking age has been eighteen in New York since 1934 and in Louisiana since 1948.

distribution before and after the change in the law for drivers aged 18 to 23 in all of the jurisdictions studied. Whereas the distributions for Michigan and Maine shifted from a bimodal to a skewed form, the distribution for Vermont during the period prior to the change in the law is already skewed with a peak at age 18. The authors conclude that states such as Vermont that are adjacent to areas with lower drinking ages may experience a "diffusion of drinking norms and practices" long before any legal changes occur. This finding allows prediction of the effect of lowering the drinking age in a particular area on the basis of the age distribution of drivers involved in crashes in that area.

This study constitutes a major contribution to the literature on this topic. It utilizes a superior design involving two types of controls and two measures of alcohol involvement, and it includes all crashes rather than only fatals. This design meets all six of the criteria we have specified. The authors assess their findings thoroughly and are cautious in drawing inferences from the data. Their analysis of age-specific distributions is innovative and has great potential utility. They also offer a number of valuable suggestions for future research and suggest ways in which the quality of data might be improved.

THE CANADIAN EXPERIENCE

All Canadian provinces lowered the drinking age between early 1970 and August, 1972, but the situation in Ontario has received the most attention.[8]

Schmidt and Kornaczewski (1975) use data for the province of Ontario in their examination of the effect of the law on three types of collisions among young drivers. They utilize a multiple time series design for the period from 1968 to 1972. The actual change in the law occurred in late July, 1971.

Their first analysis compares the proportion of drinking drivers involved in collisions for each year before and after the change in the law. The trends indicate that most of the reported increase in collisions for young drivers during the year after the change is likely due to the lowering of the drinking age. Nevertheless, the possibility remains that these increases are a result of more diligent reporting by police of alcohol-involvement among this group.

In order to control for reporting factors and to circumvent the problems of stability associated with the shortness of the time series and the use of small numbers of collisions as in the case of fatal crashes, the authors use before-after ratios of the number of drivers involved in all collisions for each year, age group, and type of collisions. Thus, the design does fulfill all the requirements we have specified. Cases are assigned to the numerator or denominator on the basis of the time when they occurred: whether January to July or August to December. These categories are based on the before and after months of the year in which the law was changed.

Sixteen to nineteen-year-old drivers involved in collisions in 1971 is the only category to experience a statistically significant decrease in the January to July: August to December ratio of collisions. This pattern obtains for all three types of collisions (Schmidt and Kornaczewski, 1975).

The data available to these researchers fail to meet two of the less critical criteria we have outlined: the division of cases into age groups that do not correspond exactly to those affected by the law, and the one-year reporting period that precludes separation into the appropriate months before and after the change in the drinking age. However, as the authors note, these factors only reduce the apparent effect of the change in the law and result in a conservative estimate of its effect. The results of this research constitute important preliminary evidence for an effect of the change in the law, but more focussed data are required to further test the hypothesis.

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8. In addition to the study by Warren et al. (1977) another study was also conducted in Saskatchewan (Whitehead and Shattuck, 1976) and it suggests that the lowering of the drinking age did have as an impact a higher incidence of collision involvement among young drivers.

Whitehead et al. (1975) collected extensive information from police records on young drivers in London, Ontario for the years 1968 to 1973. Data were gathered for individuals aged 16, 17, 18, 19, 20 and 24 that were involved in any type of collision. These were used in a time series analysis with 24-year-old drivers serving as a comparison group. Twenty-four-year-olds constitute a useful comparison group because these young people would have drinking and driving patterns reasonably typical of young people generally. Thus, changes in those factors that may occur independently of the change in the law can be controlled for statistically. Furthermore, the possibility that this group would also be affected by the greater availability of alcoholic beverages to their younger peers, would produce conservative estimates of the effect of the change in the law among 18 to 20-year-old drinking drivers.

Results of the analysis show dramatic increases in alcohol-related collisions among young drivers during the two-year post-law period (Whitehead et al., 1975). Increases of more than 300 percent for 18 and 19-year-olds and over 150 percent for 20-year-olds are recorded. In contrast, 24-year-olds are involved in only 20 percent more alcohol-related collisions during this period. Examination of the time series shows an increase of 174 percent for 18 to 20-year-olds during the first year after the change in the law, which is far in excess of changes that occurred in previous years. Furthermore, this increase is maintained the following year. Twenty-four-year-olds experience no such increase during the first year and in fact show a decrease during the second year to a level of incidence comparable to that for the years prior to the change.

The possibility that there was increased vigilance by police in reporting alcohol-related collisions among young drivers is addressed from several perspectives. First, the increase in total collisions is sufficient to account for the rise in alcohol-related collisions. This is not what one would expect if reporting factors alone were responsible for the increase in alcohol-related collisions. Second, an examination of the local press at the time of the change in the law produced no evidence that an increase in collisions among young drivers was expected. In fact, the change in the legal age was welcomed by law enforcement officials. Third, the design includes two different measures of alcohol-involvement, similar to those used by Douglass et al. (1974): 1) alcohol-related collisions are those recorded by the police as "had been drinking" or "impaired - alcohol"; and 2) a more objective measure involves the comparison of total collisions among young drivers at two different times of the day (9 a.m. to 3 p.m. when little drinking and driving is likely to occur, and 9 p.m. to 3 a.m. when it is likely to be most prevalent). Percentage increases in total collisions for the nighttime period are approximately double those for the daytime period. However, almost the entire increase in total collisions among 24-year-olds occurs during the daytime period. These different approaches to investigating the effect of reporting procedures clearly eliminate them as important factors in the increase in collisions that occurs following the change in the law.

One final consideration in assessing this research is the relatively long time series, particularly the period after the change in the law. This is advantageous because it allows one to distinguish between two different effects of the change in the law. A return to the pre-law incidence of collisions during the second year after the change would add greater weight to the reporting hypothesis and would, at least, suggest that no permanent change in drinking-driving habits occurred. However, the results of the London study indicate that the increase is maintained during the second year after the change and this makes these findings somewhat more conclusive than those of previous research. The possibility of extending the time series even further is a feature of the design used in this study and it permits a more detailed examination of the long-range effects of lowering the drinking age.

The design meets almost all the criteria that were invoked earlier. The only exception is that the analysis was not conducted by type of collision. The fact that all (or total) collisions were included mitigates the problem of generalizability, but does not take away from the fact that separate opportunities to test the hypothesis are absent.

Zylman (1976) has commented on this research. He contends that the results of the London study are questionable because of documented variations in the reporting of all types of collisions in various jurisdictions and because of changes in reporting of alcohol-related collisions following the introduction of the .08 law and a concomitant increase in cases of suspension of driver licenses in Canada. The logic in this particular line of reasoning is unclear, for nowhere does Zylman provide evidence that these variations in reporting practices are age-specific or that they occur at the time of the change in the law.

Zylman suggests that examining the ratio of injury to non-injury collisions and comparing ratios for young drivers and older drivers would reveal evidence of the effect of reporting factors if the ratio increased. This line of reasoning is flawed because a real increase in alcohol-related collisions could result in either a larger or smaller proportion with associated injury, depending on the nature of the change in drinking practices and other factors. Nevertheless, this analysis was conducted (see below).

Zylman's second major point is that the gradual increase in drinking that occurred among young people during the past decade or so probably accounts for the increased incidence of alcohol-related collisions. He ignores the abrupt change that occurred following the change in the law, a fact that cannot be accounted for by the general rise in drinking among young people.

Finally, he cites his own analysis of the effect of the change in the law in Michigan as evidence of his contention that the law had no particular effect. His omission of the clearly superior work of Douglass et al. (1974) among others who have examined the situation in Michigan detracts considerably from the credibility of his position.

We have replied to Zylman in as comprehensive and definitive a way as possible (Whitehead, 1976c) by systematically dealing with each of Zylman's points and identifying many of the ambiguities and misleading statements in Zylman's argument. Readers are encouraged to closely examine Zylman's (1976) "Comment". Aspects of our "Reply" (Whitehead, 1976c) are dealt with below and in Chapter III.

The issue of reporting practices and the role they may have played is addressed and we have discussed it above. The reply to Zylman also makes a number of other points which have been missed or ignored. One of the most crucial is that an effect of the change in the drinking age on the collision involvement of young people is not dependent on a comparable or concurrent increase in drinking among young people. There are studies that indicate that the use of alcoholic beverages among young people was increasing before the drinking age was lowered (Smart and Fejer, 1975) and there is some evidence that drinking practices may have been affected by the change in the drinking age (e.g., Schmidt, 1972; Smart and White, 1972a; 1972b; Smart, 1976). However, drinking practices are not at issue. The key question is whether drinking-driving practices changed. Such practices could have changed as a result of more young people drinking more frequently than before, but the same proportion (thus greater numbers) of young people were mixing drinking and driving as previously. Or, they could have changed as a result of a greater willingness on the part of those who already drink now to mix two licit behaviours (drinking and driving) and produce an illicit one, drinking-driving. Some combination of the two is, of course, possible and in our opinion, very probable. Other factors may also operate and these have been taken into consideration (Whitehead et al., 1975). The point is that in either of the situations described above it is the liberalization of the legal measure that leads to the higher incidence of drinking-driving, whatever may be the precise mechanism through which it has its effect.

A COMPLEMENTARY ISSUE

This review of the literature has focussed on the impact of the change in the drinking age on the incidence of collisions among 18 to 20-year-old drivers. A complementary issue that is dealt with in only a few studies is the "spillover effect" of the change in the law on young people under the age of 18. With the lowering of the drinking age to 18, many secondary school students, but especially seniors, are legally allowed to drink. These persons serve as a potential source of alcoholic beverages for younger students as well as a pool of persons from whom identification materials can be borrowed.

Reports from Minnesota (Highway Safety Research Institute, 1973) and Michigan (Hammond, 1973) indicate that arrests for "Driving Under the Influence of Liquor" and "Driving While Impaired" among underage drinkers increased substantially following the change in the law in those states. These increases were comparable to those recorded for 18 to 20-year-old drivers.

Four studies of the effect of lowering the legal drinking age on collision behaviour include drivers under the age of 18 in their design. Cucchiaro et al. (1974) collected time series data for drivers under the age of 18 in Massachusetts, but found that the series was not acceptable for further analysis. Naor and Nashold (1975) included 16 and 17-year-olds in their study of fatal

crashes in Wisconsin, but were limited in their interpretations by the very small numbers involved. Two other studies were more successful.

Williams et al. (1975) documented an increase in fatal crashes among drivers aged 15 to 17 in areas where the drinking age was reduced. This increase was somewhat less than that recorded for 18 to 20-year-olds. Using a longer follow-up period, Whitehead et al. (1975) concluded that alcohol-related collisions increased among 16 and 17-year-olds, but the increase occurred chiefly during the second year following the change in the law. This is probably due to the extra time required for the diffusion of drinking and drinking-driving practices ("spillover effect") to occur. Thus, the evidence points to a real effect of the change in the law on underage drinkers. Research involving longer periods after the legal change will enable us to ascertain whether further effects, of this delayed variety, have been experienced.

CONCLUSIONS

This review of the literature has described and evaluated a number of studies of the impact of the change in the drinking age on the incidence of collisions among young drivers. Our purpose has been to document what we now know about the effect of the change and to come to some conclusions about what actually occurred. It should be clearly understood that none of these studies employs the classical experimental design that makes the ascertainment of causality possible. Rather, as we have pointed out, at their best these studies use quasi-experimental designs wherein attempts are made to approximate -- though one cannot equal -- the classical experimental design. This means that causality cannot be ascertained directly. Instead, it can only be inferred. When the design is a reasonable approximation of the classical experimental design the strength of the inferences of causality is greater than when designs are less adequate.

Our review indicates that those studies that employed superior methodologies and analyzed the data most fully were those that produced results that support the inference of an effect of the change in the law (cf., Williams et al., 1975; Cucchiaro et al., 1974; Douglass et al., 1974; Schmidt and Kornaczewski, 1975; Whitehead et al., 1975). These studies were able to control for reporting factors and for most threats to internal validity by using a multiple time series design with appropriate non-equivalent control groups. They used designs that fulfilled all of the major and most of the minor criteria that we have specified. In some cases (e.g., Cucchiaro et al., 1974) supplementary data had to be introduced to meet these requirements. Nevertheless, they allow for strong inferences.

Our current knowledge on this subject can be summarized as follows: the lowering of the drinking age did result in what Douglass et al. (1974) call "statistically and socially significant" increases in all types of alcohol-related collisions among young people affected by the change in the law. In fact, the collision involvement for young impaired drivers may now equal or exceed that of older drivers. Young drinking-drivers under the age of 18 also appear to be affected, but there appears to be a time-lag involved. However, jurisdictions in which drinking and driving patterns among underage drinkers prior to the law are similar to those of areas where the drinking age has already been lowered are unlikely to experience a measurable effect of the new law.

Increases and, in some cases, dramatic increases in alcohol-involved collisions among young drivers have been observed following the lowering of the legal drinking age. There exists no body of evidence to support the often repeated speculation that there were rampant or widespread changes in reporting practices that led to appreciable overreporting of alcohol-related collisions among young drivers. The contention that changed reporting practices rather than the lowering of the drinking age better accounts for increased involvement in alcohol-related collisions is unwarranted theoretically and unsupported empirically. Unfortunately, there have been no studies that have focussed on reporting practices and examined them directly in order to ascertain whether they changed as a function of the social and legal process surrounding the lowering of the legal drinking age. Indirect tests of this question, through the use of objective surrogate measures, fail to support the idea that reporting practices changed.

Such conclusions aside, several gaps in our knowledge still exist. We require studies that can examine certain factors in greater detail and we need to know more about the long-range impact of the change in the drinking age. On the basis of previous analyses, the effect appears to be permanent rather than transient, but data for more extended periods of time are required. Little is known about the effect of the law on young females. Most studies have used data for males alone or combined those for both sexes. Larger samples may be necessary because of the lower incidence of alcohol-related collisions among young women. Similar problems are associated with the study of drinking drivers under the age of 18. It appears that the diffusion effect on this group is not immediate, but we don't know how long it really takes to have its maximum effect.

It is to such considerations that much of the remainder of this study is devoted. In addition, we will examine the theoretical relevance of our findings as well as their implications for social policy.

CHAPTER III

METHODOLOGY:
AN EXTENSION OF THE LONDON STUDY

The current investigation involves an extension of a previous study of the impact of the change in the drinking age that was carried out in London, Canada in 1973 (Whitehead et al., 1975). It was described in the review of the literature, but it will be discussed here in greater detail.

DESIGN

The original design employed was a quasi-experimental multiple time series covering a period of three and one-half years prior to the change in the law, which was in July, 1971, and two years following it.

Police records of all traffic collisions in the City of London from January, 1968 to July, 1973 were searched. Data from collisions that involved drivers at the time aged 16, 17, 18, 19, 20 or 24 were culled and coded. These included the following: age and sex of the driver, date of the collision, time of day, and condition of the driver at the time of the collision according to the police officer's report.

Drivers aged 16 and 17 were included in order to examine whether the change in the law had an effect on the drinking-driver behavior of younger age groups. We expected that it would, since alcoholic beverages would now be more available to 16 and 17-year-olds who could obtain them from their slightly older 18-year-old peers in the same secondary schools and, in many cases, the same classes. They would also have more opportunity to buy alcoholic beverages, using borrowed forms of identification from their 18-year-old schoolmates.

Drivers aged 24 were included to provide a comparison group (non-equivalent control group, in the language of quasi-experimental design) of persons who were not affected by the change in the law. Their inclusion is based on the premise that general changes in driving conditions should be reflected in the collision experience of 24-year-olds.

Adequacy of the comparison group. It was not possible for us to obtain data on all drivers involved in collisions in London who were not aged 16 to 20, although this may have been preferable. Thus, it raises a question about the adequacy of 24-year-olds serving as a comparison group. Fortunately, some evidence exists on this issue. It should be noted, however, that the design employed in this study does not rely solely on this comparison group for its internal validity. The interrupted time series approach is a vital component in our attempt to isolate the impact of the change in the law.

Table 3.1 presents the incidence of total and alcohol-related collisions among the male drivers aged 16-20 and 24 in London and among all drivers in Ontario before and after the change in the alcohol-purchasing age. Unfortunately the Ontario data are not available by age and sex. If 24-year-olds constitute an appropriate comparison group for the purpose of the current analysis, the following should obtain:

1) Rates of change in alcohol-related collisions and total collisions among all drivers in Ontario should be far more similar to the rates among 24-year-old men in London than to the rates of the 16- to 20-year-olds;

2) Rates of collisions among all drivers in Ontario should be higher than the rates among 24-year-old men in London (unless rates for older drivers are very much lower), since drivers aged 16 to 20 are included in the Ontario data;

3) The percentage of total collisions accounted for by alcohol-related collisions prior to the change in the law should be similar among 24-year-olds in London and all Ontario drivers;

4) The proportion of the increase in total collisions accounted for by alcohol-related collisions should be more similar among the London 24-year-olds and all drivers in Ontario than either of these compared with drivers aged 16 to 20 in London.

The incidence of alcohol-related collisions and total collisions presented in Table 3.1 suggests that the London 24-year-olds constitute an adequate comparison group.

1. The 24-year-olds in London exhibit a 25 percent increase in alcohol-related collisions and all drivers in Ontario a 35 percent increase, compared with a 244 percent increase among the drivers aged 16-20 in London. Much of the difference between 25 percent and 35 percent is probably due to the fact that 16- to 20-year-olds are included in the calculation of the 35 percent increase. The rate of increase in total collisions among all Ontario drivers is also higher (22 percent) than among 24-year-olds in London (12 percent), but it is still lower than the rate of 27 percent found among 16- to 20-year-olds in London.

2. The rates of alcohol-related and total collisions among all drivers in Ontario are higher than among the 24-year-old London drivers.

TABLE 3.1

Standardized Incidence[a] of Alcohol-Related and Total Collisions Among Drivers[b] in London and Ontario Before and After the Change in the Law and Percentage of Total Collisions that Were Alcohol-Related

	Age 16-20		Age 24		Ontario[d]	
	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total
BEFORE LAW[c]	95	2,679	44	591	41,115	526,207
AFTER LAW[c]	327	3,398	55	659	55,609	640,411
PERCENTAGE CHANGE	+244	+27	+25	+12	+35	+22
Percentage Alcohol-Related						
BEFORE LAW[c]	3.6		7.5		7.8	
AFTER LAW[c]	9.6		8.4		8.7	
PERCENTAGE OF INCREASE ACCOUNTED FOR BY ALCOHOL-RELATED COLLISIONS	32.3		16.2		12.7	

a) Standardized on basis of 2-year post-law period.

b) Ontario, all drivers involved in collisions; London, males only.

c) Ontario, 1 January 1968 to 31 December 1970 and 1 January 1972 to 31 December 1973; London, 1 January 1968 to 31 July, 1973, as data for Ontario are only available to 1973.

d) Source: Morton (1974).

3. Prior to the change in the law, alcohol-related collisions constituted 7.5 percent of total collisions among the London 24-year-olds and 7.8 percent among all Ontario drivers. Following the change in the law, 8.4 percent of total collisions were alcohol-related among the 24-year-olds and 8.7 percent among all Ontario drivers. Among the 16- to 20-year-olds in London, the proportion of total collisions that were alcohol-related prior to the change in the law was small (3.6 percent), but after the change in the law it became similar to that of drivers in other age groups (9.6 percent).

4. By using 24-year-olds in London as a proxy for drivers other than young drivers, it can be estimated that 16.2 percent of the increase in total collisions would be due to the increase in alcohol-related collisions in that group. The same estimate would be only 12.7 percent if data from all drivers in Ontario were used. Thus, 24-year-olds decrease the likelihood of finding an increase in the collision involvement of younger drivers. Both of these rates are dissimilar to the rate of 32.3 percent observed for young drivers in London. In addition, when we examine the change in the incidence of total collisions among all male drivers in London 21 years of age or over, we find that it was only 5 percent compared with the increase of 12 percent that occurred among 24-year-olds (Table 3.2). Thus, comparisons with the 24-year-olds would tend to underestimate the difference between those who were affected by the change in the law and those who were not.

   Thus, 24-year-olds constitute an adequate comparison group for the analysis to be conducted here. However, even if the data from all drivers in Ontario had been used instead, none of the directions of the major findings would have changed.

   The crucial point is that imperfections associated with the use of 24-year-olds as representative of other drivers produce errors that are loaded against the hypothesis of a real effect of the change in the drinking age. The test of the hypothesis is a conservative one wherein one is likely to miss a real effect rather than to incorrectly infer that one exists.

Condition of driver. The item condition of driver is a checklist of the following categories: "normal", "had been drinking", "ability impaired by alcohol", "ability impaired by drugs", "fatigue", "medical or physical defect" or "other". The police regularly completed the item - in only about 3 percent of cases was no information recorded. The condition of most drivers is designated as "normal". A very small and relatively constant proportion (1.5 percent) of drivers were listed as "ability impaired by drugs", "fatigue", "medical or physical defect" and "other". The London police have indicated to us both privately and publicly that if they smell alcoholic beverages, they consider that the driver "had been drinking" and that if the person also staggers, has slurred speech or any of the other usual signs of impairment, that constitutes "impaired-alcohol". These designations are separate from any charges that the officer might lay in any given instance.

TABLE 3.2

Standardized Incidence[a] of Total Collisions Among Male Drivers in London Before and After the Change in the Law

	Age 16-20	Age[b] 21+	Total	Age 24
BEFORE LAW	2,679	20,169	22,993	591
AFTER LAW	3,398	21,204	24,783	659
PERCENTAGE CHANGE	+27	+5	+8	+12

a) Standardized on basis of the first 2 years of the post-law period.

b) Source: Morton (1974).

The policeman makes a judgment about whether the person had been drinking or is impaired by alcohol and in this sense the assessment is subjective. It is, of course, possible that some errors may occur in making such assessments. However, the fact that the assessments are subjective and the acknowledgement that there may be some error hardly means that such assessments are grossly unreliable or invalid. Criteria on which the assessments are based are quite objective and police personnel are trained to recognize them: to smell alcoholic beverages; to hear slurred speech; to see staggering. Nevertheless, what deficiencies there are in such measures are compensated for with the use of objective surrogate measures.

In this study an alcohol-related or alcohol-involved collision is one in which the investigating officer has indicated on the report about the collision that the condition of the driver was either "had been drinking" or "impaired-alcohol". The incidence of "had been drinking" and "impaired-alcohol" is reported in Chapter IV, Table 4.3.

NOTES ON REPORTS OF POLICE

The issue of the subjectivity of these police reports of alcohol involvement has been raised by Zylman (1974). His analysis of the effect of lowering the drinking age in Michigan indicates an apparent increase in the number of young drivers involved in alcohol-related collisions. However, he suggests that this increase was probably due to changes in the reporting practices of the police. He surmised that the change in the law brought about a "clamor by safety officials, news media, legislators and others" that resulted in pressure on the police to record "any evidence of alcohol whether it was thought to be a causal factor or not", as opposed to their earlier practice, which Zylman says was to record the presence of alcohol "only in the most criminally negligent cases" (Zylman, 1974). An article by Hammond (1973) suggests that such a "clamor" probably did occur in Michigan. However, the claim that prior to the lowering of the drinking age the Michigan police recorded the presence of alcohol "only in the most criminally negligent cases" remains unsubstantiated.

In London, we have found no evidence of the phenomena alleged by Zylman. Our recollections of that period have been supported by a search of the files of the local newspaper (London Free Press) for the period shortly prior to the implementation of the new age of majority to six months after it became effective. No newspaper article mentioned the possibility that a change in the law would increase problems related to drinking and driving. In fact, the news items we found pointed to the fact that police officials felt the change was a positive one. The Chief of Police in London was described as "in agreement with the lowering of the drinking age", which was to take effect in two weeks, and he was quoted as describing the legislation as "inevitable and progressive" (London Free Press, 1971a). The Chief of Police in a neighbouring community saw the proposed change as evidence that "we... are working our way out of the archaic liquor laws" (London Free Press, 1971b). No letters to the editor appears on this topic.[1] Thus, at least in London, there is no evidence that pressure was placed, or felt by, the police to become especially vigilant about an expected increase in drinking and driving among 18- to 20-year-olds. This does not prove that changes in reporting practices did not take place, but if they did take place it was not the result of public clamour or publicly expressed concern on the part of police officials. Zylman has suggested additional means of ascertaining the possibility of changes in reporting practices having taken place.

In a comment on the London study, Zylman (1976) indicates that "a fairly reliable way to determine whether collisions involving youth are being reported differently after the change in the law would be to examine the ratio of injury to non-injury collisions. If the number of reported youth-involved collisions increased substantially but the proportion of those collisions involving injuries declined, it could be assumed that there was an increased effort to report collisions in general (i.e., more of the non-injury collisions were reported)".

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1. The London Free Press has a policy of publishing virtually all letters submitted.

We have carried out this analysis and the results are as follows (Table 3.3). The number of youth-involved collisions increased substantially after the lowering of the drinking age: the standardized incidence went from 359 to 629. However, before the change in the law, personal injury collisions accounted for 18 percent of the collisions among young drivers and after the change in the law they accounted for 25 percent of collisions. Therefore, what we have is actually the opposite of what would be found if Zylman were correct in arguing that there was a greater effort to report minor (non-personal injury) collisions after the change in the drinking age.

TABLE 3.3

Standardized Incidence[(a)] of Personal Injury Collisions Among Male Drivers Before and After the Change in the Law (Jan. 1, 1968-July 27, 1971; July 28, 1971-July 31, 1973)

	Age 18-20		Age 24	
	N	Percent of Total Collisions	N	Percent of Total Collisions
BEFORE LAW	359	18	87	14
AFTER LAW	629	25	138	21

a) Standardized on basis of the first 2 years of the post-law period.

Zylman also suggests a second comparison, this one between youth and "middle-aged drivers". Unfortunately, we do not have information on middle-aged drivers, but we do have it for some older drivers, 24-year-olds, and this appears quite suitable for the test, suggested by Zylman, to examine the possibility of changes in reporting practices. This test involves two steps: first, an examination of whether "proportionately fewer accidents among young drivers involve injuries than do accidents among middle-aged drivers"; and second, if there is such a disparity, an examination of whether "the disparity increased at about the time the age of majority changed". These tests produce the following results (Table 3.3).

Before the change in the drinking age, young drivers actually had a higher rate of involvement in personal injury collisions as a proportion of total collisions than 24-year-olds; 18 percent to 14 percent. This disparity is just the reverse of what Zylman predicted. The change in the age of majority was followed by an increase in the proportion of injury-involved collisions and this increase was about the same for both young drivers and 24-year-olds: 25 percent to 21 percent, respectively. Hence, contrary to Zylman's hypothesis, our results do not indicate that there is any tendency to overreport less serious accidents involving young drivers; nor does such a trend occur following the change in the law.

FEATURES OF THE PROPOSED ANALYSIS

The use of a time series that extends in both directions for more than six months beyond the change in the law is advantageous for two reasons. First, it allows some capacity for discerning the diffusion of any effects of the change. This is particularly important relative to the 16-and 17-year-olds who, we expected, would not show as immediate an effect as would the 18-and 19-year-olds. Second, the longer time series helps to balance the effect of a period that might be unusually high or low due to ordinary year-to-year fluctuations. This is of special importance since 1970 happened to have an unusually low rate of collisions relative to the other years we studied. Not only was this true of London, but it was true of Ontario as a whole (Schmidt and Kornaczewski, 1974; Morton, 1974) and of the State of Michigan (Gray, 1974). This appears to be part of and consistent with the relationship between collision involvement and economic conditions (Gray, 1974) wherein there is a lower incidence of collisions in times of worsening economic conditions. The fact that a similar pattern obtained in Michigan during this year as well as in Canada strongly suggests that the economic factor probably operated rather than an as yet undocumented "rebound" effect from the introduction of the .08 law in Canada in 1970.

Our design also includes consideration of the time of day when collisions occurred. This allows us to examine whether there may have been an effect on young drivers resulting from the change in the age of majority that is independent of the change in the alcohol-purchasing age. We compare rates of collisions before and after the change in the law for two time periods of the day: one in which the incidence of drinking and driving is likely to be highest and one in which it is likely to be lowest. This also provides an independent (surrogate) measure of alcohol-involvement. If total nighttime collisions increase to a much greater extent than total daytime collisions, this can be attributed to a disproportionate increase in collisions that involve alcohol.

The 1973 study (Whitehead et al., 1975) focussed on the impact of the change in the law on the incidence of alcohol-related and total collisions among young male drivers aged 18 to 20 and aged 16 to 17. The two-year follow-up period was lengthy compared with those found in most other studies (see, for example, Schmidt and Kornaczewski, 1975; Williams et al., 1975), but it still did not permit a full assessment of the following: transient effects; effects on female drivers; and it is too short to adequately measure the diffusion effect of the change relative to 16- and 17-year-olds. It is primarily for these reasons that the collection of data on collisions was extended another two years up to July, 1975. The present study is based on a time series that extends from January, 1968 to July, 1975. This time series includes a longer period subsequent to the change in the law than before (4 vs. 3.5 years); thus where necessary, the data have been standardized on the basis of the 3.5 year period.

In addition to retesting the original hypotheses with data from the more extensive time series, additional analyses are carried out in the current study. Collisions involving property damage and personal injury are treated separately. There were too few fatal collisions (N=41) to analyze them separately. Also, the larger number of cases makes it possible to conduct separate analyses on young females, a much neglected sector of the population in this area of research.

The extended time series also permits us to apply other statistical techniques to test our hypotheses. We will use regression techniques, in the form of path analyses, to examine the relative influence of different factors on the increase in alcohol-related collisions. As Cucchiaro et al. (1974) have noted, this is more feasible when several data points following the change in the law are available.

The design we have produced and the analyses to be conducted on the data from our extended time series will form the basis for inferences about the role of lowering the drinking age on the collision behavior of young drivers. These inferences will assist us in sorting out some central issues in studies on alcohol and these in turn have implications for social policy.

CHAPTER IV

RESULTS

Two major approaches are taken in analyzing our data in order to ascertain the impact of the lowering of the legal age for the purchase and consumption of alcoholic beverages on the collision involvement of young drivers. The first is a straightforward multi-variate tabular analysis that our design allows for very nicely. The second is a path analysis that more precisely allows us to appreciate the relative contributions of various factors to the increased incidence of collisions and alcohol-related collisions after the lowering of the legal drinking age.

TABULAR ANALYSIS

The annual incidence of alcohol-related collisions and total collisions among young drivers for three years prior to the change in the law, which occurred in July, 1971, and for four years following it are examined in Table 4.1. Large numerical increases in alcohol-related collisions occur among 18- to 20-year-olds during the first year after the legal change. Such increases are not manifest among drivers, aged 16 and 17 or by those aged 24. In subsequent years, collisions involving alcohol continue to increase among 16- to 20-year-olds, but do not increase among 24-year-olds until the third year after the change. Total collisions involving 18- to 20-year-olds increase abruptly in the first year after the change and again during the third year. Collisions involving the younger and older groups of drivers increase abruptly during the third year after the change in the law, but not before this time.

Sex differences. The time series data are presented separately for males and females (Table 4.1). In all age groups, males are involved in almost five times as many collisions as females and their rate of alcohol-involved collisions is seventeen times as high. The number of alcohol-related collisions among young women is very small and is therefore not amenable to extensive analysis. However, a few observations can be made.

The incidence of alcohol-related and total collisions among female drivers may follow much the same pattern as that for male drivers, but the small numbers do not allow us to infer this from the data. Large increases in total collisions occur during the year 1973-74 and level off the following year. The numbers of alcohol-related collisions among 16-, 17- and 24-year-olds also do not increase until that year. They may also increase at the time of the change in the law for 18- to 20-year-olds, but this is difficult to assess.

There are some changes in the sex ratios of these data on incidence, but they do not occur at the time of the change in the law. These ratios do not decline until the third year after the change and they do so among all age groups for both alcohol-related and total collisions. Due to the fact that there are so few females and because males are more likely to be the social category that would manifest an impact from the lowering of the drinking age, females are excluded from the remainder of the analysis.

A clearer picture of the changes that occur over time among male drivers can be obtained by examining the annual percentage change in the incidence of collisions among the different age groups (Table 4.2). Annual variations in total collisions are not large except for the year 1973-74 when all age groups experience a major increase in total collisions. However, 18- to 20-year-olds experience a fairly large increase during the first year after the change in the law and this is far in excess of that for the comparison group of 24-year-olds.

Alcohol-related collisions show a much greater annual variation. This may be due to the small numbers involved, especially during the early years of the time series. Among 16-and 17-year-olds, the largest percentage increase is found in the second year after the change, a year in which the incidence of alcohol-related collisions among 18- to 20-year-olds increases only slightly and in which it decreases quite markedly among the 24-year-old comparison group. Eighteen to 20-year-olds experience an even larger increase in this type of collision and it occurred immediately after the drinking age was lowered. We find a large increase among 24-year-olds in the third year after the change in the law, but this is accompanied by a fairly large increase in total collisions as well.

TABLE 4.1

Annual Incidence of Alcohol-Related Collisions and Total Collisions Among Male And Female Drivers, 1968-1975 (as of 1 July Each Year)

Year	16-17				18-20				24				Total			
	Alc-rel		Total		Alc-rel		Total		Alc-rel		Total		Alc-rel		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1968-69	4	1	337	64	44	3	1,047	213	14	3	291	75	62	7	1,675	352
1969-70	7	-	358	67	37	2	981	209	25	1	282	71	69	3	1,621	347
1970-71	8	1	393	72	47	1	957	194	24	1	312	61	79	3	1,662	327
CHANGE IN LAW																
1971-72	13	1	396	81	131	4	1,202	224	32	1	348	75	176	6	1,946	380
1972-73	27	-	447	89	145	6	1,313	205	21	2	303	96	193	8	2,063	390
1973-74	36	3	642	139	179	11	1,787	382	42	3	441	131	257	17	2,870	652
1974-75	44	3	664	136	214	17	1,699	415	40	2	415	134	298	22	2,778	685
Total	139	9	3,237	648	797	44	8,986	1,842	198	13	2,392	643	1,134	66	14,615	3,133

TABLE 4.2

Annual Incidence of Alcohol-Related and Total Collisions Among Male Drivers, 1968-1975 (as of 1 July Each Year)

Year	16-17				18-20				24			
	Alc-Rel		Total		Alc-Rel		Total		Alc-Rel		Total	
	N	% Change	N	% Change	N	% Change	N	% Change	N	% Change	N	% Change
1968-69	4		337		44		1,047		14		291	
1969-70	7	+ 75%	358	+ 6%	37	- 16%	981	- 6%	25	+ 79%	282	- 3%
1970-71	8	+ 14%	393	+10%	47	+ 27%	957	- 2%	24	- 4%	312	+11%
CHANGE IN LAW												
1971-72	13	+ 62%	396	+ 1%	131	+179%	1,202	+26%	32	+ 33%	348	+12%
1972-73	27	+108%	447	+13%	145	+ 11%	1,313	+ 9%	21	- 34%	303	-13%
1973-74	36	+ 33%	642	+44%	179	+ 23%	1,787	+36%	42	+100%	441	+46%
1974-75	44	+ 22%	664	+ 3%	214	+ 20%	1,699	- 5%	40	- 5%	415	- 6%

Over the entire length of the time series, alcohol-related collisions increase eleven-fold among 16- and 17-year-olds and total collisions double in number. The comparable changes among 18- to 20-year-olds are a five-fold increase in alcohol-related collisions and about a sixty percent rise in total collisions. Alcohol involvement almost triples among 24-year-olds and total collisions rise 40 percent.

"Had Been Drinking" vs. "Impaired-Alcohol": Alcohol-involved collisions are of two types: those in which the driver is described as "ability impaired by alcohol" and those in which he is listed as "had been drinking". The standardized incidence of the two types of collisions is presented in Table 4.3. All age groups show an increase in both types of alcohol-related collisions when the periods before and after the change in the law are compared. The increase in the incidence of collisions where the driver had been drinking is most marked among the 18- and 19-year-olds, while the lowest rate of increase is among those aged 20. The lowest rate of increase of impaired-alcohol collisions is among 16- and 17-year-olds. Nevertheless, these increases are considerably greater than among 24-year-old drivers.

To supplement these data, we examined the ratio of had-been-drinking to impaired-alcohol collisions among all drivers in Ontario before the change in the law and for the two-year period following it for which data were available. During the period 1968 to 1970, the ratio was 3.1:1; during 1972 to 1973 it was 2.3:1. This constitutes a decrease of 26 percent. Among young drivers in London the ratio decreased from 9.6:1 to 7.0:1, or 27 percent. Thus, the increase in the proportion of drivers considered to be impaired appears to reflect a general trend that is not specific to any particular age category.

Since the number of collisions in which the driver was reported to be impaired by alcohol is so small, they are combined with the had-been-drinking collisions in the remainder of this analysis.

Before and after comparison. The incidence of total collisions and alcohol-related collisions for male drivers has been standardized for the periods before and after the change in the law on the basis of the 3.56 years pre-law period (Table 4.4). All ages show an increase in both total collisions and alcohol-related collisions and a disproportionate increase in alcohol-related collisions. However, the size of these increases varies considerably by the age of the driver. Alcohol-related collisions increase by 469 percent among 18-year-old drivers and 445 percent among 19-year-olds while their rate of total collisions increases 66 percent and 61 percent, respectively. Sixteen and 17-year-olds experience a 304 percent increase in alcohol-related collisions and a 50 percent rise in total collisions. Twenty-year-olds show a somewhat lower rate of increase: 187 percent for alcohol-related collisions and 37 percent for total collisions.

Twenty-four-year-olds register much lower increases for both types of collisions. Among this comparison group, alcohol-related collisions increase 54 percent while total collisions increase 28 percent. When we compare all young drivers with the 24-year-old comparison group, we find that the younger age categories demonstrate an increase in alcohol-related collisions that is six times as great as the 24-year-olds and an increase in total collisions that is almost twice as great as the 24-year-olds. Nevertheless, the standardized increase in the total number of collisions among younger drivers exceeds the increased number of alcohol-related collisions by a ratio of almost 5 to 1 (2,522 to 547, respectively).

We also examined the change in the proportion of collisions that are alcohol-related for the periods before and after the change in the law. The proportion for 24-year-olds increases only 20 percent from 7.5 percent to 9.0 percent. However, among young drivers, it increases 172 percent from 3.6 percent to 9.8 percent. Thus, the final proportion is fairly close to that of the comparison group of 24-year-olds. The largest changes in this proportion are among 18- and 19-year-olds, from only 3.1 percent and 3.6 percent respectively, before the change in the law, to 10.6 percent and 12.1 percent after the change in the law.

TABLE 4.3

Standardized[(a)] Incidence of Collisions Involving Male Drivers Who "Had Been Drinking" (HBD) or had "Ability Impaired Due to Alcohol" (IMP) Before and After the Change in the Law (January, 1968-July, 1975)

	16-17				18				19				20				Total				24			
	HBD		IMP		HBD		IMP		HBD		IMP		HBD		IMP		HBD		IMP		HBD		IMP	
	N	STD[(a)]	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD	N	STD
BEFORE LAW Jan. 1968-July 1971	23	23	4	4	31	31	1	1	37	37	5	5	63	63	6	6	154	154	16	16	71	71	8	8
AFTER LAW Aug. 1971-July 1975	106	94	16	14	179	159	26	23	226	201	31	28	194	173	28	25	705	627	101	90	108	96	29	26
PERCENTAGE CHANGE	+309%		+250%		+413%		+2,200%		+443%		+460%		+175%		+317%		+307%		+463%		+35%		+225%	

a) Standardized on the basis of the period prior to the change in the law.

TABLE 4.4

Standardized[(a)] Incidence of Total Collisions and
Alcohol-Related Collisions for Male Drivers
Before and After the Change in the Law (1968-1975)

	16-17		18		19		20		Total		24	
	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total
	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD
BEFORE LAW	27 27	1,285 1,285	32 32	1,042 1,042	42 42	1,175 1,175	69 69	1,282 1,282	170 170	4,784 4,784	79 79	1,059 1,059
AFTER LAW	122 109	2,170 1,931	205 182	1,938 1,725	257 229	2,127 1,893	222 198	1,974 1,757	806 717	8,209 7,306	137 122	1,519 1,352
PERCENTAGE CHANGE	+304%	+50%	+469%	+66%	+445%	+61%	+187%	+37%	+322%	+53%	+54%	+28%

	$\frac{\text{Alc-Rel}}{\text{Total}}$	$\frac{\text{Alc-Rel}}{\text{Total}}$	$\frac{\text{Alc-Rel}}{\text{Total}}$	$\frac{\text{Alc-Rel}}{\text{Total}}$	$\frac{\text{Alc-Rel}}{\text{Total}}$	$\frac{\text{Alc-Rel}}{\text{Total}}$
BEFORE LAW	2.1%	3.1%	3.6%	5.4%	3.6%	7.5%
AFTER LAW	5.6%	10.6%	12.1%	11.3%	9.8%	9.0%
PERCENTAGE CHANGE	+167%	+242%	+236%	+109%	+172%	+20%

a) Standardized on the basis of the period prior to the change in the law.

The data for the entire time series can be examined in greater detail by dividing each year into two six-month periods (Table 4.5). The large increases in alcohol-related collisions that occur among 18- to 20-year-olds are maintained during the four subsequent six-month periods and increase after that time to an even higher level. Sixteen and 17-year-olds experience an increase during the second year after the change in the law and a further increase during the two subsequent years. The incidence among 24-year-olds shows no change at all until the year 1973-74 when it shows the same kind of increase as the other age groups. The ratios of alcohol-related to total collisions are consistently low for 18-, 19- and 20-year-olds prior to the lowering of the drinking age and rise to a level that is consistently higher than was the case prior to lowering the drinking age and similar to that for 24-year-olds following the legal change.

Time of day. Our design includes a consideration of the time of day when collisions occur. This serves two functions: first, it allows us to examine the alternative hypothesis that the increases we have found might be due in large measure to factors other than the lowering of the drinking age, which resulted from the change in the age of majority. For example, 18-20-year-olds could legally enter into contracts and might be more likely to obtain loans and purchase automobiles allowing them greater opportunity to drive, thus placing them more at risk than prior to the change in the law. If this hypothesis were correct, we would expect to find comparable increases in total collisions at both times of the day: during the daytime when alcohol is unlikely to be involved in collisions and during the late evening when the likelihood of its involvement increases sharply.

The second purpose of considering the time of day of collisions is that it provides a measure of alcohol-involvement that is independent of the more subjective police reports. Since drinking-driving is more apt to occur during the late evening than during daytime hours, we would expect that a disproportionate increase in total collisions during the later time of day would indicate an increase in alcohol-involvement. Such an increase would considerably underestimate the change as some alcohol-related collisions do occur during the day and the majority of nighttime collisions do not involve alcohol. The standardized incidence of both total and alcohol-related collisions among young male drivers is presented for two time periods: 9 a.m. to 3 p.m. (Table 4.6) and 9 p.m. to 3 a.m. (Table 4.7). Increases in total collisions occurring during the daytime period were the same for 16- and 17-year-olds and for 24-year-olds (33 percent). The changes in the incidence were somewhat higher for the 18- to 20-year-olds, ranging from 49 percent for 20-year-olds to 70 percent for 18-year-olds. Changes in the incidence of nighttime collisions were quite different. Among 18- to 20-year-olds, there was an increase of 82 percent, versus only 25 percent for 24-year-olds. Thus, increases in total collisions were more than 60 percent higher at night for young drivers, but they actually decreased from 33 percent to 25 percent for our comparison group of 24-year-olds (Table 4.8).

Severity of collisions. There is considerable variation in the degree of damage that is associated with collisions, both to the people and to the property involved. There is evidence that alcohol-involvement is associated with a greater severity of damage generally. Thus, we would expect to find that any disproportionate increases in alcohol-involvement in collisions among young drivers would lead to disproportionate increases in those collisions that involve a greater degree of damage. In order to assess this, we examined the incidence of those collisions involving only property damage (Table 4.9) and those that result in personal injury (Table 4.10). The number of fatal collisions is too small (N=41) to permit separate analysis.

Most collisions involve only property damage (about 80 percent) while personal injury occurs in about 20 percent of all collisions. However, when we examine those that are alcohol-related we find that fully one-third of these collisions involve personal injury.

When we compare collisions involving property damage and those resulting in personal injury, we find that there is little difference among 16- and 17-year-olds for either alcohol-related or total collisions, but some variation occurs for 18-20-year-olds and even more for 24-year-olds. Alcohol-related collisions among 16- and 17-year-olds increase 306 percent for property damage collisions and 300 percent for personal injury cases. Total collisions rise 53 percent and 55 percent, respectively. Similar increases in alcohol-related collisions occur for both types of collisions among 18- to 20-year-olds (343 percent and 377 percent), but the increase for total collisions is almost twice as great for those involving personal injury (89 percent, compared to 46 percent).

TABLE 4.5

Incidence of Alcohol-Related and Total Collisions for Male Drivers for Six-Month Intervals Between January, 1968 and June, 1975

		16-17			18			19			20			24		
		Alc-Rel	Total	Alc-Rel / Total	Alc-Rel	Total	Alc-Rel / Total	Alc-Rel	Total	Alc-Rel / Total	Alc-Rel	Total	Alc-Rel / Total	Alc-Rel	Total	Alc-Rel / Total
1968	Jan.-June	8	171	4.7	2	121	1.7	5	144	3.5	6	185	3.2	16	161	9.9
	July-Dec.	2	179	1.1	9	169	5.3	9	163	5.5	9	204	4.4	4	130	3.1
1969	Jan.-June	2	158	1.3	2	146	1.4	6	173	3.5	9	192	4.7	10	161	6.2
	July-Dec.	4	193	2.1	4	169	2.4	7	185	3.8	14	193	7.3	14	150	9.3
1970	Jan.-June	3	165	1.8	1	133	.8	5	158	3.2	6	143	4.2	11	132	8.3
	July-Dec.	5	207	2.4	10	142	7.0	6	166	3.6	11	173	6.4	14	162	8.6
1971	Jan.-June	3	186	1.6	4	140	2.9	4	166	2.4	12	170	7.1	10	150	6.7
	July-Dec.	8	203	3.9	21	201	10.5	21	203	10.3	29	194	15.0	16	163	9.8
1972	Jan.-June	5	193	2.6	17	185	9.2	18	205	8.8	25	214	11.7	16	185	8.7
	July-Dec.	15	237	6.3	24	222	10.8	36	239	15.1	24	211	11.4	11	155	7.1
1973	Jan.-June	12	210	5.7	16	206	7.8	25	229	10.9	20	206	9.7	10	148	6.8
	July-Dec.	17	299	5.7	22	270	8.2	33	315	10.5	24	261	9.2	23	213	10.8
1974	Jan.-June	19	343	5.5	31	316	9.8	38	332	11.5	31	293	10.6	19	228	8.3
	July-Dec.	21	395	5.3	41	272	15.1	46	306	15.0	36	315	11.4	24	206	11.7
1975		23	269	8.6	30	258	11.6	31	280	11.1	30	268	11.2	16	209	7.7
Total		147	3,408	4.3	234	2,950	7.9	290	3,264	8.9	286	3,222	8.9	214	2,553	8.4
Total Before Law(a)		27	1,285	2.1	32	1,042	3.1	42	1,175	3.6	69	1,282	5.4	79	1,059	7.5
Total After Law(a)		109	1,931	5.6	182	1,725	10.6	229	1,893	12.1	198	1,757	11.3	122	1,352	9.0
Percentage Change		+304%	+50%		+469%	+66%		+445%	+61%		+187%	+37%		+54%	+28%	

a) Standardized on the basis of 3.58 years prior to the change in the law.

TABLE 4.6

Standardized[(a)] Incidence of Alcohol-Related and Total Collisions
Between 9 a.m. and 3 p.m. Among Male Drivers Before and After
the Change in the Law and Percentage of Total Collisions That Were Alcohol-Related

	16-17		18		19		20		Total		24	
	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total
	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD
BEFORE LAW	- -	297 297	- -	223 223	3 3	281 281	4 4	292 292	7 7	1,093 1,093	6 6	249 249
AFTER LAW	1 1	444 395	8 7	427 380	13 12	487 433	8 7	490 436	30 27	1,848 1,645	5 4	372 331
PERCENTAGE CHANGE	-	+33%	-	+70%	+300%	+54%	+75%	+49%	+286%	+51%	+50%	+33%

	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total
BEFORE LAW	-	-	1.1%	1.4%	.6%	2.4%
AFTER LAW	.3%	1.8%	2.8%	1.6%	1.6%	1.2%
PERCENTAGE CHANGE	-	-	+155%	+14%	+167%	-50%

a) Standardized on basis of 3.5 year pre-law period.

TABLE 4.7

Standardized[(a)] Incidence of Total and Alcohol-Related Collisions
Between 9 p.m. and 3 a.m. for Male Drivers
Before and After the Change in the Law

	16-17		18		19		20		Total		24	
	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total	Alc-rel	Total
	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD	N STD
BEFORE LAW	5 5	222 222	18 18	202 202	27 27	239 239	35 35	243 243	85 85	906 906	36 36	192 192
AFTER LAW	73 65	481 428	111 99	446 397	146 130	500 445	134 119	428 381	464 413	1,855 1,651	73 65	270 240
PERCENTAGE CHANGE	+1,200%	+93%	+450%	+97%	+381%	+86%	+240%	+57%	+386%	+82%	+81%	+25%

	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total	Alc-Rel / Total
BEFORE LAW	2.3%	8.9%	11.3%	14.4%	9.4%	18.8%
AFTER LAW	15.2%	24.9%	29.2%	31.2%	25.0%	27.1%
PERCENTAGE CHANGE	+561%	+180%	+158%	+117%	+166%	+44%

a) Standardized on basis of 3.5 year pre-law period.

TABLE 4.8

Percentage Change in the Standardized[(a)] Incidence of Collisions
Following the Change in the Law for Two Time Periods

Time Period	16-17	18	19	20	Total	24
9 a.m.-3 p.m.	33%	70%	54%	49%	51%	33%
9 p.m.-3 a.m.	93%	97%	86%	57%	82%	25%

a) Standardized on basis of 3.5 year pre-law period.

TABLE 4.9

Annual Incidence of Alcohol-Related and Total Collisions Involving Property Damage Among Male Drivers, 1968-1975 (as of 1 July Each Year)

	16-17				18-20				24			
	Alc-Rel		Total		Alc-Rel		Total		Alc-Rel		Total	
	N	Change	N	Change	N	Change	N	Change	N	Change	N	Change
1968-69	4		278		31		866		13		255	
1969-70	4	+ 0%	275	- 1%	28	- 1%	820	- 5%	14	+ 8%	231	- 9%
1970-71	4	+ 0%	299	+ 9%	31	+ 1%	758	- 8%	17	+21%	273	+18%
1971-72	12	+200%	293	- 2%	89	+187%	893	+18%	19	+12%	276	+ 1%
1972-73	20	+ 67%	343	+17%	93	+ 4%	992	+11%	16	-16%	242	-12%
1973-74	20	+ 0%	502	+46%	111	+ 19%	1,420	+43%	27	+69%	353	+46%
1974-75	28	+ 40%	518	+ 3%	143	+ 29%	1,339	- 6%	29	+ 7%	320	- 9%
Standardized Total Before Law[b]	18		997		98		2,848		57		903	
Standardized Total After Law[c]	73		1,525		434		4,166		83		1,081	
Percentage Change	+306%		+53%		+343%		+46%		+46%		+20%	

a) Standardized on basis of 3.5 year pre-law period.
b) January 1, 1968 - July 27, 1971.
c) July 28, 1971 - July 31, 1975.

TABLE 4.10

Annual Incidence of Alcohol-Related and Total Collisions Involving Personal Injury Among Male Drivers, 1968 to 1975 (as of 1 July Each Year)

	16-17				18-20				24			
	Alc-Rel		Total		Alc-Rel		Total		Alc-Rel		Total	
	N	Change	N	Change	N	Change	N	Change	N	Change	N	Change
1968-69	-		57		13		178		1		36	
1969-70	3		81	+42%	9	- 31%	161	-10%	11	+1,000%	52	+44%
1970-71	4	+ 33%	94	+16%	16	+ 78%	199	+24%	7	- 36%	39	-25%
1971-72	1	- 75%	103	+10%	42	+163%	305	+53%	13	+ 86%	72	+85%
1972-73	7	+600%	103	0%	51	+ 21%	320	+ 5%	5	- 62%	61	-15%
1973-74	16	+129%	139	+35%	68	+ 33%	366	+14%	15	+ 200%	88	+44%
1974-75	16	0%	146	+ 5%	71	+ 4%	360	- 2%	11	- 27%	95	+ 8%
Standardized Total Before Law[b] [a]	9		280		44		636		22		153	
Standardized Total After Law[c]	36		435		210		1,201		39		284	
Percentage Change	+300%		+55%		+377%		+89%		+77%		+86%	

a) Standardized on basis of 3.5 year pre-law period.
b) January 1, 1968 - July 27, 1971.
c) July 28, 1971 to July 31, 1975.

This pattern is further developed among 24-year-olds with a 77 percent increase in alcohol-related collisions involving personal injury versus 46 percent for those involving damage to property, and 86 percent of total collisions resulting in personal injury compared to only 20 percent of property damage collisions.

We have previously inspected the proportion of total collisions involving personal injury among young drivers (cf., Table 4.10) and found that there were similar increases among both 18- to 20-year-olds and 24-year-olds following the change in the law.

A further measure of severity uses the mean annual value of property damage for both alcohol-related and total collisions among male drivers (Table 4.11). Generally speaking, the average value of property damage increases moderately over the length of the time series. The increases are fairly regular for total collisions, but the data are somewhat unstable for alcohol-related collisions. There do not appear to be any unusual increases in these mean values for total collisions following the change in the law. Since the mean value of alcohol-related collisions is somewhat higher than for total collisions, we would expect a disproportionate increase in the mean value for total collisions among the age group affected by the change in the drinking age.

PATH ANALYSIS

Assessing the impact of the change in the legal drinking age on traffic collisions involves a number of considerations, several of which have already been examined. A particularly crucial one is the timing of the impact of the change in the drinking age.

The ideal situation, from a methodological perspective, would involve an abrupt rise in the incidence of collisions at the time of the change in the law and a levelling off shortly thereafter, as is illustrated in Figure 4.1. If the reality conformed to this model, an adequate assessment of the impact of the change in the drinking age could be made by simply comparing the incidence of collisions before the change with the incidence following the change. The difference could be attributed to the change in drinking age if appropriate controls are used.

Unfortunately, data in the real world never conform to ideal models and an examination of scattergrams reveals that a more accurate reflection of the situation for most collisions involves a somewhat more gradual though still marked change in the pattern of incidence (Figure 4.2). Before the change in the legal drinking age, the incidence of collisions was increasing slightly over time. However, after the lowering of the drinking age, the slope is steeper, indicating a greater rate of increase in traffic collisions over time. Of greatest importance and interest here, then, is a comparison of rates of change rather than absolute levels before and after 28 July, 1971.

Path analysis, an application of multiple regression analysis, can be used to demonstrate the impact of the change in the drinking age on the rates of increase of selected dependent variables. These include total number of collisions, mean dollar amount of damage to vehicles, number of injuries, and number of fatalities.

In this type of analysis, the variable "alcohol-related collisions" is used as an intervening variable. The main reason for doing this is to control for the possibility that any change in rates of increase may be due to factors other than alcohol that may be increasing at an accelerating rate over time. For example, the mean damage to vehicles should be increasing as a result of inflation as well as because collisions are becoming more serious due to an increase in drinking-driving by young drivers. By including alcohol-related collisions as an intervening variable, we can distinguish the contributions of alcohol-related and general increases over time in the dependent variables, types of collision.

Time is the independent variable in our path models. It is operationalized (represented by) the number of the week wherein week number "1" is the first week in January, 1968 to week number "365" which is the last week of July, 1975. Thus, the week is taken as the unit of analysis.

TABLE 4.11

Mean Annual Property Damage for Alcohol-Related and Total Collisions for Male Drivers, 1968 to 1975 (as of 1 July Each Year)

	16-17				18-20				24			
	Alc-rel		Total		Alc-rel		Total		Alc-rel		Total	
	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change	Mean	% Change
1968-69	158		336		576		332		1,327		718	
1969-70	586	+271	339	+ 1	670	+16	451	+36	641	-52	402	-44
1970-71	613	+ 5	366	+ 8	648	- 3	410	- 9	556	-13	337	-16
CHANGE IN LAW												
1971-72	382	- 38	402	+10	626	- 3	441	+ 8	726	+31	460	+36
1972-73	522	+ 37	499	+24	684	+ 9	482	+ 9	766	+ 6	473	+ 3
1973-74	1,275	+144	555	+11	806	+18	531	+10	687	-10	478	+ 1
1974-75	936	- 27	669	+21	945	+17	750	+41	548	-20	572	+20

FIGURE 4.1

Ideal Relationship Between the Incidence of Traffic Collisions and Time Relative to the Change in the Drinking Age

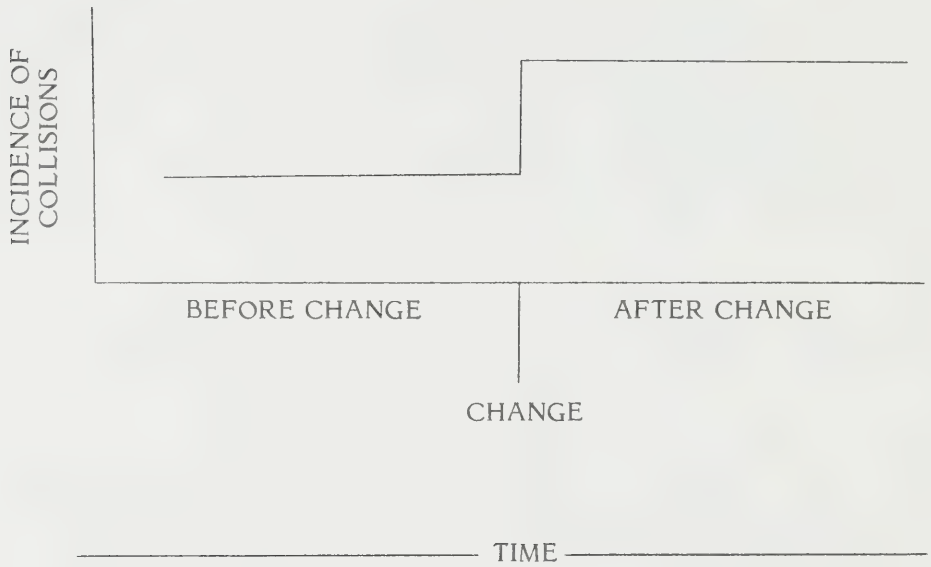
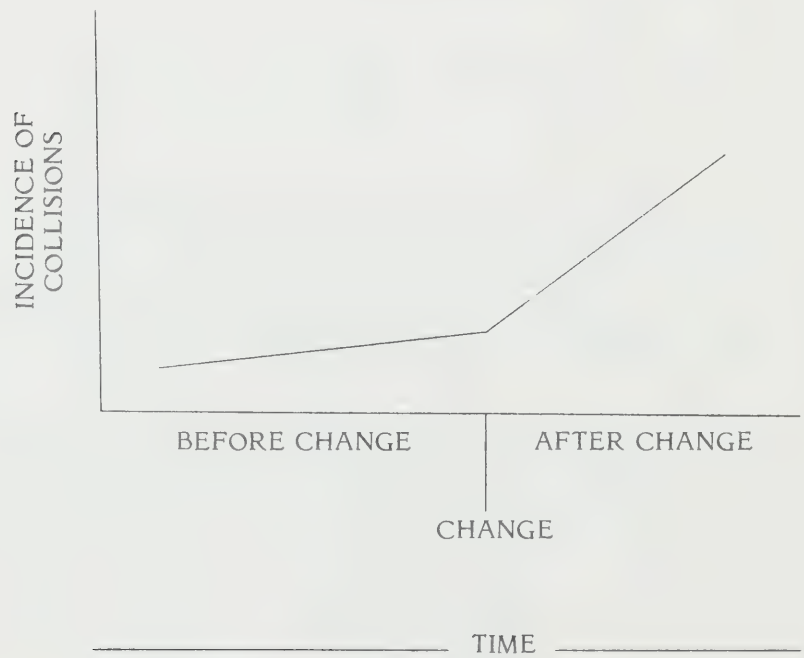


FIGURE 4.2

Observed Relationship Between the Incidence of Traffic Collisions and Time Relative to the Change in the Drinking Age



Separate analyses are conducted for males and females and four models are presented for each sex. The first two involve 16- to 20-year-olds for the periods before and after the change in the legal drinking age. The third and fourth are comparison groups of 24-year-olds who would not have been directly affected by the age change, also examined for the periods preceding and following the change in the drinking age.

Figure 4.3A is the path model for all males between the ages of 16 and 20 years for the period prior to 28 July, 1971 (1 January, 1968 - 27 July, 1971). There are only three beta coefficients (standardized partial slopes) that are statistically significant ($P < .05$). Two of these are the total number of collisions and the number of injuries on the number of alcohol-related collisions with betas of .35 and .17, respectively. These slopes indicate that changes in the rates of alcohol-related collisions, total collisions, and number of injuries tend to covary. However, it is noteworthy that the slope of alcohol-related collisions on time is only .02 indicating a near-zero rate of increase in this intervening variable for the period preceding 28 July, 1971. The third significant slope is for number of fatalities regressed on week number ($b = -.20$). This shows a declining rate of fatalities for the period before the change in the legal drinking age.

Figure 4.3B is the path model for 16- to 20-year-old males for the period following the change in the drinking age. The most important difference compared with the model in Figure 4.3A is the slope of .30 for alcohol-related collisions. This indicates that a significant increase in alcohol-related collisions occurs after 28 July, 1971 and not before. This increase is reflected in steeper slopes for total collisions and mean damage to vehicles due to factors other than alcohol. The beta weights for these variables on time are $b = .25$ and $b = .36$, respectively.

An estimate of the effect of time operating through alcohol-related collisions on the dependent variables can be determined by taking the product of the slopes between alcohol-related collisions on time, and a specific dependent variable on alcohol-related collisions. For example, in the case of total collisions, time has a direct "effect" of $b = .25$ on rates of total collisions. However, time also has an indirect "effect" through alcohol-related collisions. The magnitude of this indirect effect can be estimated by taking the product of the slope of alcohol-related collisions on time (.30) and total collisions on alcohol-related collisions (.40). Thus, the indirect effect is .12, which means that approximately one-third of the increase in total collisions over time can be attributed to the change in the rate of alcohol-related collisions.

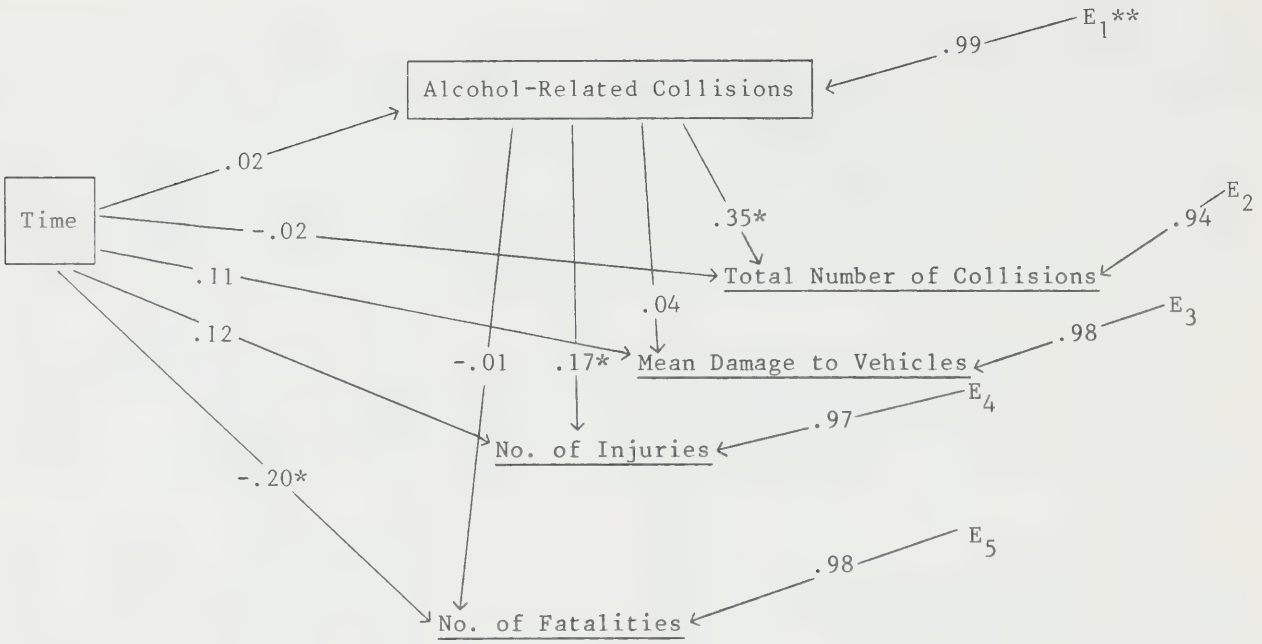
A closer examination of Figure 4.3B reveals that the indirect effects of the changing rate of alcohol-related collisions are primarily on total collisions, indirect effect = .12 and number of injuries indirect effect = .09, an amount equal to the direct effect of time ($b = .09$).

The differences between the path models just examined (Figures 4.3A and 4.3B) take on additional meaning when they are contrasted with the path models displayed in Figures 4.4A and 4.4B where only 24-year-olds are included. The latter age category should not have been affected by the change in the legal drinking age. That is, during the period preceding 28 July, 1971 this group was able to drink legally. Hence, the change in the legal drinking age should logically have had no effect on them. An examination of Figures 4.4A and 4.4B reveals that the change in the legal drinking age indeed had little or no effect on the collisions involvement of this age category. Both the direct and indirect effects of time on total collisions are very small before and after the change in the law.

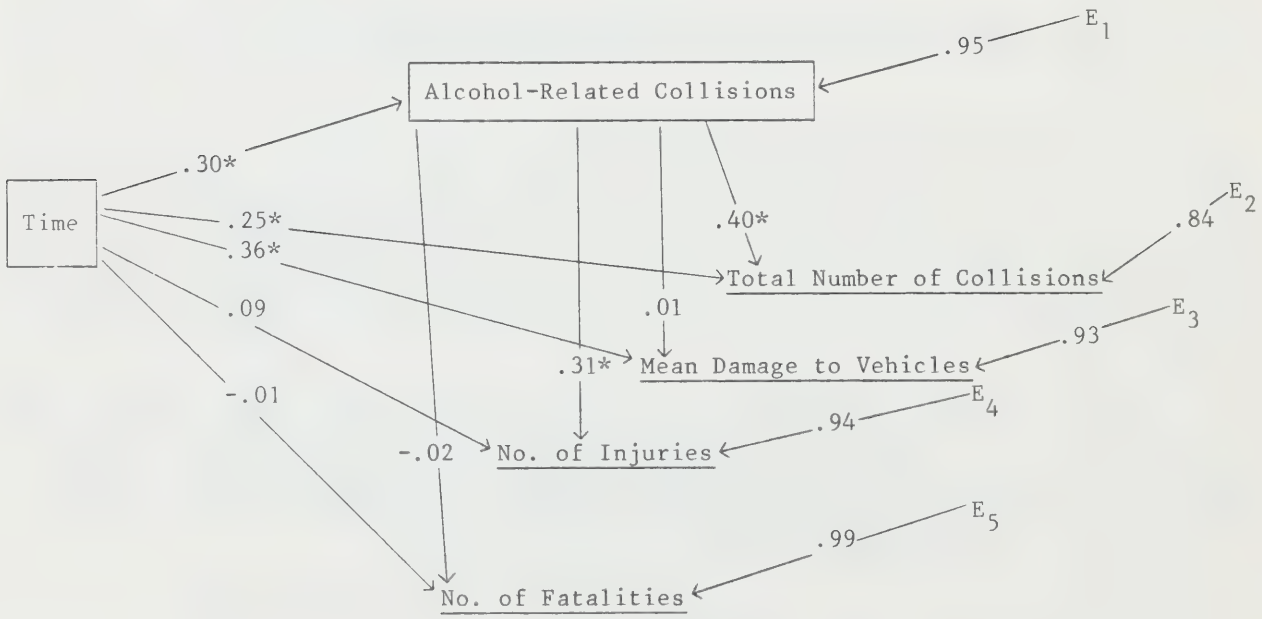
Figures 4.5 and 4.6 demonstrate that the patterns shown for the males in Figures 4.3 and 4.4 generally hold for females in the same age categories. The major differences between the sexes appear to be the low level of covariance between changes in total collisions and alcohol-related collisions for 24-year-old females after the change in the legal drinking age. However, this difference has no particular theoretical relevance for us.

FIGURE 4.3

A - Males, 16-20 Years Old: Before the Change in the Legal Drinking Age



B - Males, 16-20 Years Old: After the Change in the Legal Drinking Age

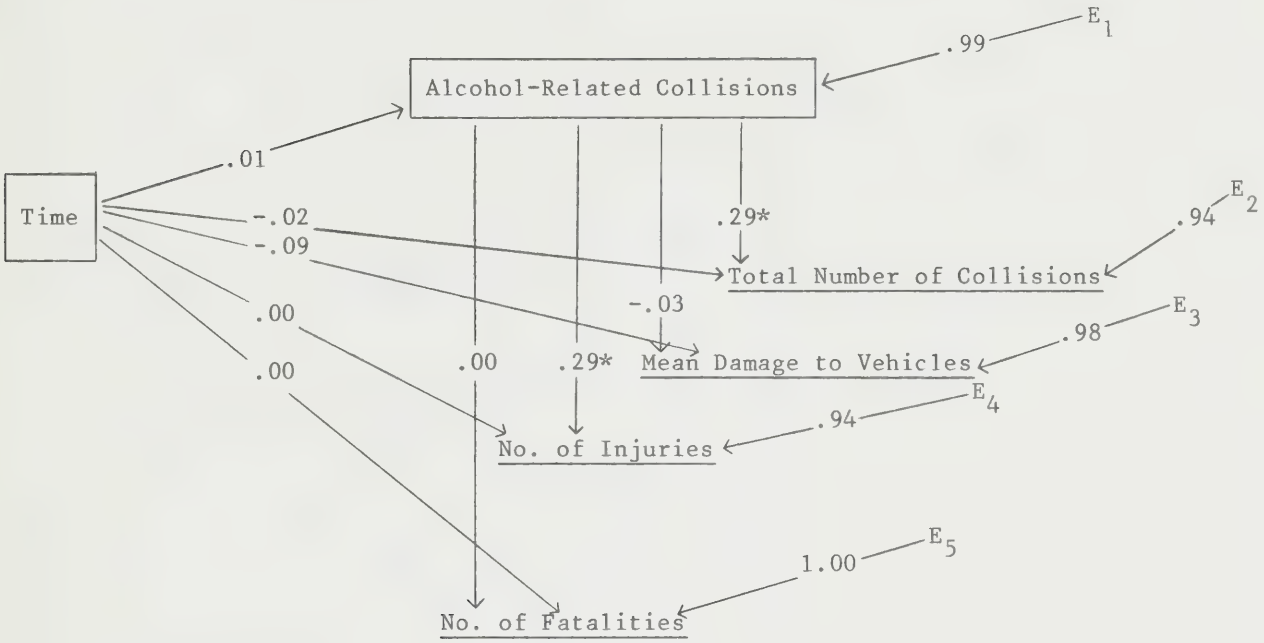


* $p \leq .05$

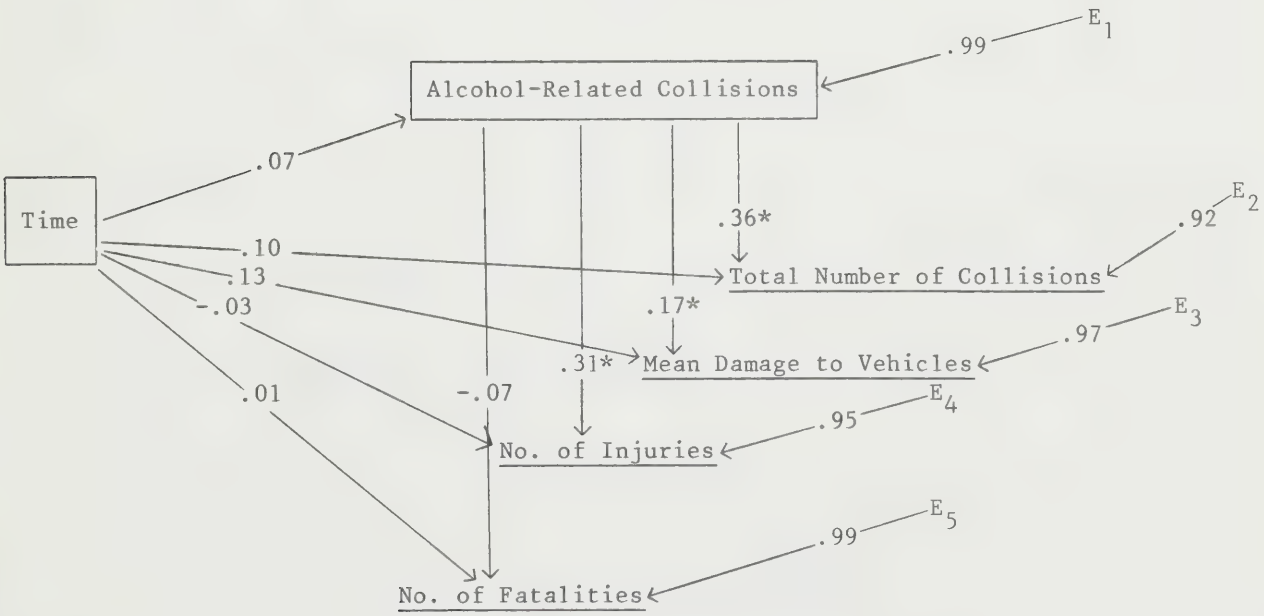
** The error term (E) is defined as $\sqrt{1-\eta_2}$ and can be used as an estimate of the amount of "unexplained" variance in the dependent variable.

FIGURE 4.4

A - Males, 24 Years Old: Before the Change in the Legal Drinking Age



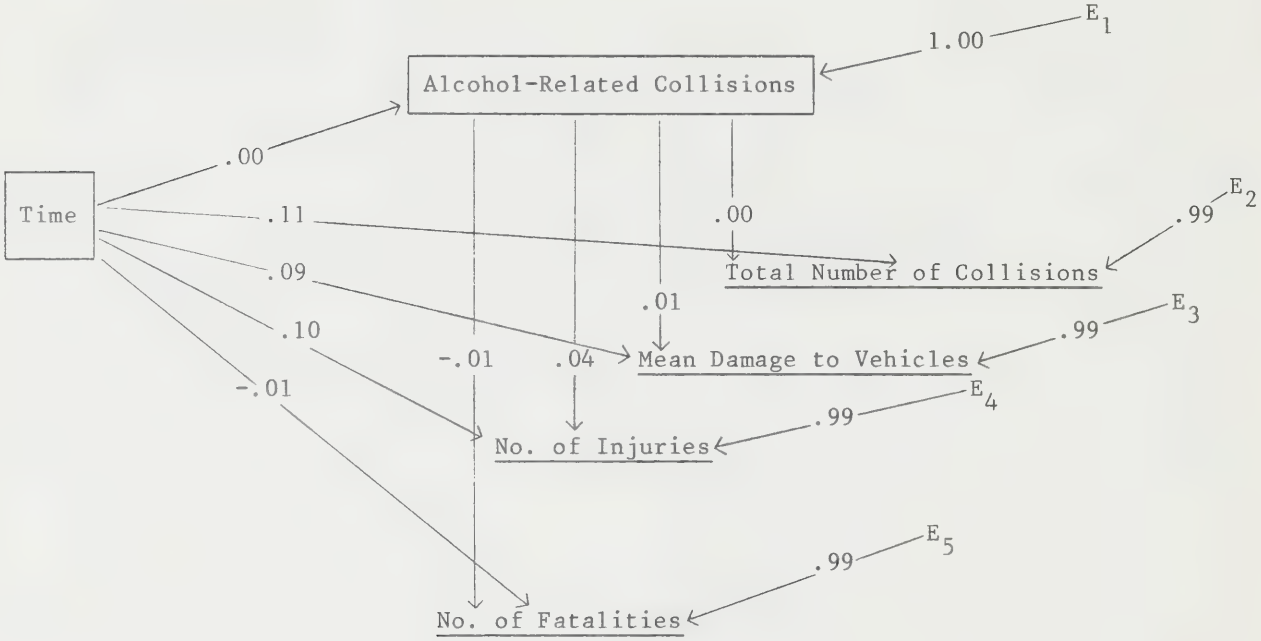
B - Males, 24 Years Old: After the Change in the Legal Drinking Age



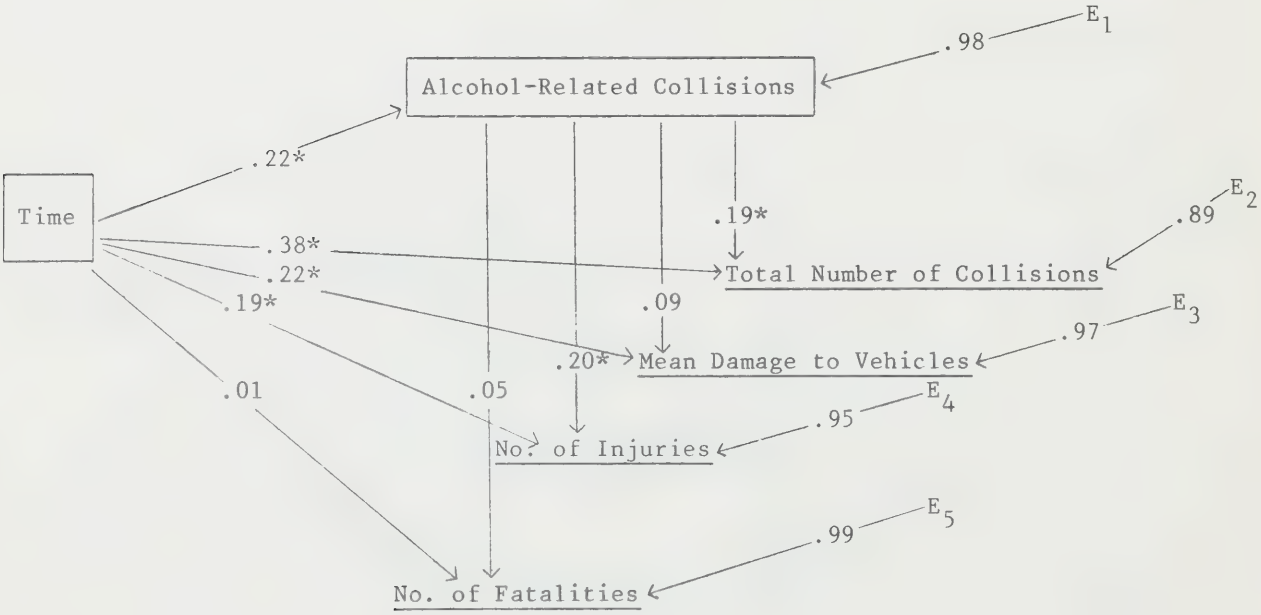
* $p \leq .05$

FIGURE 4.5

A - Females, 16-20 Years Old: Before the Change in the Legal Drinking Age



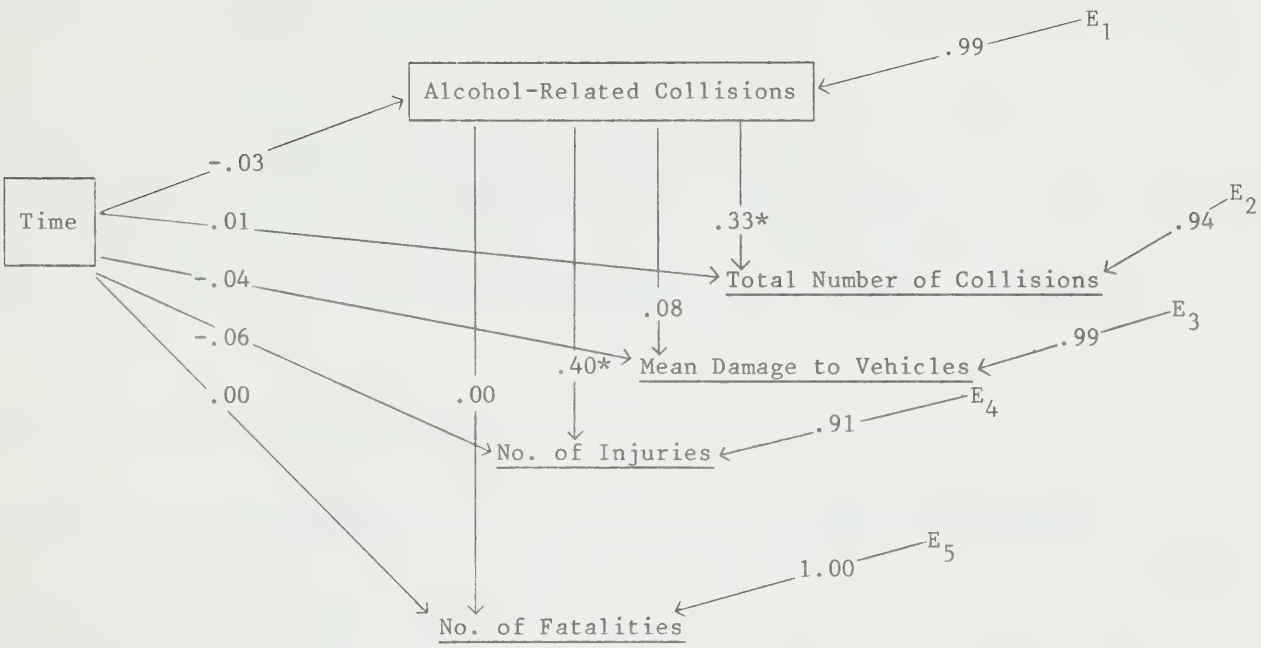
B - Females, 16-20 Years Old: After the Change in the Legal Drinking Age



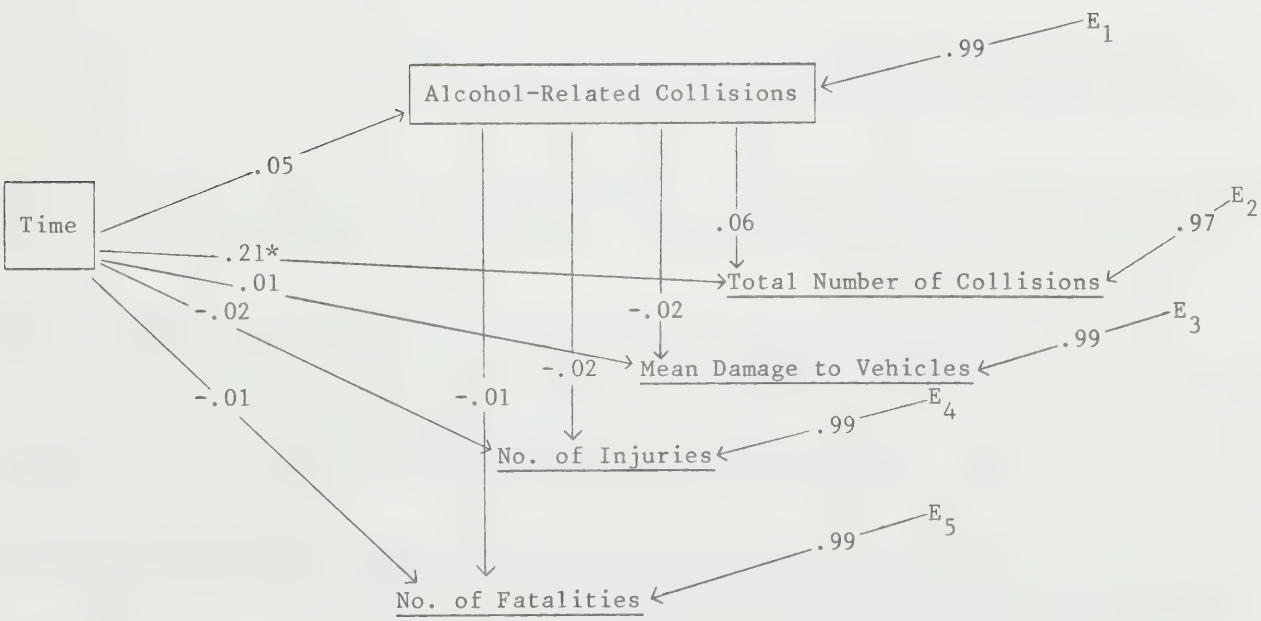
* $p \leq .05$

FIGURE 4.6

A - Females, 24 Years Old: Before the Change in the Legal Drinking Age



B - Females, 24 Years Old: After the Change in the Legal Drinking Age



* $p \leq .05$

We have calculated the zero-order correlations between time and the other variables (Table 4.12), and the zero-order correlations between rates of alcohol-related collisions and the other dependent variables (Table 4.13). The age-sex category that experienced the greatest shift after the change in the legal drinking age in terms of its effect on alcohol-related collisions is 16- and 17-year-old male drivers. Prior to the change, alcohol-related collisions in this age category actually decline over time (b = -.06), but following it, they increase more than for any other age category (b = .24). Significant changes also occur for males aged 18 and 19 and for females aged 18 and 20.

The relationships between alcohol-related collisions and the dependent variables are presented in Table 4.13. The correlations between alcohol-related and total collisions increase substantially for male drivers aged 16 to 20 after the change in the drinking age. A much smaller increase is observed for 24-year-old males. Prior to the change, the association is strongest for 24-year-old males and declines with decreasing age. Following the legal change, the correlations for those age categories affected directly by the change in the drinking age exceed that for 24-year-olds. A similar pattern is found for total collisions among females with the exception of 16- and 17-year-olds and for personal injury collisions among males.

SUMMARY

On the basis of the analyses that have been conducted and reported the following points emerge.

Alcohol-related and total collisions increase after the lowering of the drinking age for both males and females, but because the number of females is so small strong inferences are not possible.

Alcohol-related collisions for each age category that was directly affected by the lowering of the drinking age (18-, 19- and 20-year-olds) display a marked increase following the change in the law. The incidence of total collisions also increases and these numerical increases are in all cases greater than the increased incidence of alcohol-related collisions.

The incidence of alcohol-related and total collisions increases among young drivers who appear to have been directly affected by the lowering of the drinking age, 16- and 17-year-olds.

The lowering of the drinking age does not account for all of the increase in alcohol-related and total collisions among young drivers, but even when the effect of other possible contributing factors is controlled there remains an excess of collision involvement that our design allows one to infer is a product of the change in the drinking age.

The incidence of collision-involvement among young drivers shows a marked increase with the lowering of the drinking age. The pattern changes exactly where one would expect it to change if the lowering of the drinking age were going to have an effect on the collision involvement of young drivers.

Increased collision involvement among young drivers that occurs in the period shortly after the lowering of the drinking age does <u>not</u> return to a previously lower level after the initial increase. Rather, the new elevated levels are maintained and increases continue to occur.

Young drivers not directly affected by the lowering of the drinking age (16- and 17-year-olds) display an increased collision involvement that becomes apparent in the second year following the lowering of the drinking age with continued diffusion thereafter.

The lowering of the drinking age accounts for a significant increase in alcohol-related collisions among young male drivers and this increase in alcohol-related collisions accounts for approximately one-third of the increase in total collisions.

The impact of the lowering of the drinking age was greatest on alcohol-related collisions among 16- and 17-year-old male drivers.

In the following chapter we will examine the theoretical and programmatic relevance of these findings.

TABLE 4.12

Zero-Order Correlations Between Time and Total Collisions, Alcohol-Related Collisions, Mean Damage, Number of Injuries, and Both Sexes, for Periods Before and After July 27, 1971 for Five Age Categories of Both Sexes

	16-17				18				19			
	Males		Females		Males		Females		Males		Females	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Total Collisions	.12	.42*	.11	.23*	.00	.23*	.08	.34*	.03	.26*	.08	.25*
Alcohol-Related Collisions	-.06	.24*	.06	.12	.06	.20*	-.05	.16*	-.05	.19*	-.01	.05
Mean Damage	.12	.39*	.01	.16*	.01	.17*	.14*	.14*	.24*	.22*	.05	.28*
No. of Injuries	.11	-.01	.05	.12	-.09	.03	.12	.06	.14	.06	-.01	.15*
No. of Fatalities	-.08	.17*	.00	.00	-.09	-.12	.00	.00	-.12	-.05	-.01	-.04

	20				24			
	Males		Females		Males		Females	
	Before	After	Before	After	Before	After	Before	After
Total Collisions	-.16*	.25*	-.02	.26*	-.02	.13	.00	.20
Alcohol-Related Collisions	.07	.09	.00	.13*	.01	.08	-.03	.05
Mean Damage	.02	.18*	.11	.04	-.10	.15*	-.04	.01
No. of Injuries	.09	.15*	.27*	.14*	.00	.00	-.07	.02
No. of Fatalities	-.18*	.10	.00	.07	.00	.00	.00	.02

* $p \leq .05$

TABLE 4.13

Zero-Order Correlations Between Alcohol-Related Collisions, Mean Amount of Damage, Number of Injuries and Number of Fatalities for the Periods Before and After 27 July, 1971 for Five Age Categories of Both Sexes

	16-17				18				19			
	Males		Females		Males		Females		Males		Females	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Total Collisions	.13	.27*	.21*	.03	.19*	.38*	-.01	.25*	.21*	.40*	.09	.24*
Mean Damage	.03	.24*	.04	.09	.09	.04	-.01	.13*	.10	.13*	.00	.06
No. of Injuries	.02	.19*	.35*	.05	.09	.28*	.03	.30*	.13*	.27*	-.07	.08
No. of Fatalities	.03	-.05	.00	.00	-.06	.00	.00	.00	-.04	.09	-.01	-.01

	20				24			
	Males		Females		Males		Females	
	Before	After	Before	After	Before	After	Before	After
Total Collisions	.23*	.47*	.00	.17*	.29*	.37*	.33*	.07
Mean Damage	.09	.09	.00	.05	-.03	.18*	.08	-.02
No. of Injuries		.29*	.00	.05	.29*	.31*	.40*	-.02
No. of Fatalities	-.04	.01	.00	.25*	.00	-.07	.00	-.01

* $p \leq .05$

CHAPTER V

DISCUSSION:
IMPLICATIONS FOR THEORY AND SOCIAL POLICY

We have used two methods of analysis to examine the impact of the lowering of the drinking age on the incidence of traffic collisions among young drivers. Both the tabular and path analyses indicate that the change in the law is associated with an increased rate of alcohol-related collisions among 18- to 20-year-old drivers and among 16- and 17-year-old drivers. No comparable increases are experienced by our comparison group of 24-year-old drivers.

Eighteen to 20-year-olds are affected immediately, but the effect on 16- and 17-year-olds does not occur until the second year after the change in the law. Even the latter change can be attributed to the change in the drinking age because our comparison group of 24-year-olds experienced no such increase at that time. It is not surprising that the impact of the lowering of the drinking age would take a bit longer to filter down or diffuse to 16- and 17-year-olds. There was little advance notice that the drinking age was going to be lowered, so many young people may not have been socially or psychologically prepared to take immediate advantage of their new opportunities. Furthermore, opportunities for the use of alcoholic beverages developed after the lowering of the drinking age that did not exist prior to that time. For instance, some establishments changed their decor and type of entertainment in order to make them more appealing to young people than was previously the case (cf., Information Review, 1976).

In time, with a greater access to and prevalence of use of alcoholic beverages among the youngest licit drinkers (18-year-olds), the oldest illicit drinkers (16- and 17-year-olds) find it easier to acquire alcoholic beverages or materials of identification from their slightly older friends, classmates and schoolmates. These new patterns take a while to develop, so the effect is not immediate.

This diffusion of effect means that the full impact of lowering the drinking age cannot be fully observed in studies that focus on only a short period of time after the change in the law. It is noteworthy that studies of this type, for example, Schmidt and Kornaczewski's (1975) study of Ontario, were nevertheless able to infer that a significant effect had taken place even though the full magnitude of that effect was scarcely apparent in the five-month period after the change in the law that they were able to examine.

The extended time series when combined with our comparison group allows us to appreciate that by the third year after the change in the law, increases in total collisions and alcohol-related collisions are largely a function of factors other than the lowering of the drinking age. By this time, the increase is largest for 24-year-olds and is somewhat higher for total collisions than for alcohol-related collisions among 16- to 20-year-olds. If it were related to the change in the law, we would expect a greater proportional increase for alcohol-related collisions.

Young female drivers may also experience a delayed reaction to the change in the law. Our path analysis indicates that alcohol-related collisions do increase disproportionately among this group; the tabular analysis suggests that this increase occurs gradually after the change in the law. Because drinking among young women is subject to greater social disapproval than drinking among young men, it seems likely that young women, as in the case of 16- and 17-year-old males, who are subject to greater constraints than older males, require a longer time to develop behaviour patterns that include drinking-driving.

When we examine the incidence of collisions for individual age categories of young male drivers, we find that the increases are greatest for 18-year-olds, slightly less for 19-year-olds, and considerably less for 20-year-olds. A corollary to the diffusion effect among 16- and 17-year-olds probably occurs for 20-year-olds when the legal drinking age is 21. When the drinking age is lowered, 20-year-olds would not have as far to go to reach the drinking and driving levels of 24-year-olds. Further support for this interpretation is found by comparing the proportion of total collisions that are alcohol-related for the different age categories before and after the change in

the law. Sixteen and 17-year-olds end up with 5.6 percent, almost the same level. Following the change in the drinking age, the proportion of collisions among 20-year-olds that are alcohol-related is actually higher than for 24-year-olds, but is similar to that for 18- and 19-year-olds.

We examined the time of day when collisions occur to determine whether the increase in collisions might have been due to factors associated with the change in the law, other than those related to alcohol, and to provide us with a surrogate measure of alcohol involvement. Total daytime collisions increase by one-third among the 16- and 17-year-olds and the 24-year-olds. The nighttime figures are 93 percent and 25 percent, respectively. This suggests that alcohol-related collisions do, in fact, increase substantially among the 16- and 17-year-olds and that virtually the entire increase in total collisions for this age group can be attributed to increased alcohol-involvement. Eighteen to 20-year-olds experience somewhat larger increases in total collisions than 24-year-olds during the daytime hours when drinking is apt to be minimal. However, the total incidence of nighttime collisions for this group is much larger still than that for 24-year-olds. For example, when we compare 18-year-olds with 24-year-olds for daytime collisions, the respective increases are 70 percent and 33 percent; the same data for nighttime collisions are 97 percent and 25 percent. We can infer from this that some of the increase in total collisions is a result of factors affecting drivers under 21 that are not related to alcohol and are not necessarily related to the change in the age of majority. However, about one-third of the increase in the incidence of total collisions does appear to result from an increase in alcohol-involvement following the change in the drinking age. These findings also provide strong evidence that increased reporting of alcohol-involvement by the police does not adequately account for the large increases in alcohol-related collisions. Even in nighttime collisions, alcohol-involvement is relatively low (about 1 in 4 after the change in the law), yet it still produces major differences in the incidence of total collisions, compared to the daytime period.

We have examined property damage and personal injury collisions separately for two reasons. First, to see if both types of collisions are affected by the change in the law, and, second, to determine whether there are disproportionate increases in the severity of collisions that could be attributed to alcohol-involvement. Both types of collisions follow much the same pattern as do total collisions, with disproportionate increases in alcohol-related collisions occurring for 18- to 20-year-olds in the first year after the change, and for 16- and 17-year-olds during the second year for personal injury collisions and the first and second year for property damage collisions. These new findings add weight to the more limited findings that we reported previously (Whitehead et al., 1975) concerning the impact of the lowering of the drinking age.

Our investigation of the severity of collisions before and after the change in the drinking age produces mixed results. The data clearly indicate that alcohol-related collisions are associated with a greater degree of damage than those that do not involve alcohol. They result in higher mean values of property damage and a larger proportion involve personal injury. Our comparison of property damage collisions and personal injury collisions does show a disproportionate increase in the more serious kind involving personal injury for 18- to 20-year-olds. However, there is no difference for 16- and 17-year-olds, while 24-year-olds experience an even larger increase than the drivers affected by the change in the drinking age. A closer examination of the time series indicates that during the first year after the change in the law, there is no change in the incidence of property damage collisions among 24-year-olds. Personal injury collisions do increase and in the same proportion for alcohol-related and total collisions. However, the rise in alcohol-related collisions is not sustained and thus appears to constitute a normal fluctuation. Since the increase in total personal injury collisions among 24-year-olds is sustained, it appears that some factor other than the change in the drinking age produced this increase and that this is not what led to the increases for 16- to 20-year-olds. This finding is supported by the path models. Eighteen to 20-year-old males are the only group to experience an indirect effect (.09) of time on number of injuries after the change in the law that can be attributed to an increase in alcohol-involvement.

An examination of mean property damage to vehicles reveals no particular influence of the change in the law. The value of damage increases gradually over time, but this can probably be attributed to inflationary factors. This increase is more pronounced among young drivers, but it does not occur abruptly enough after the change in the law to warrant an inference of cause and effect.

The design used in this study, the extensive collection of data and the variety of techniques employed in the analysis allow for strong inferences about the effect of lowering the drinking age on collisions among young drivers. The change in the drinking age resulted in a substantial increase in the incidence of collisions among young drivers affected directly by the change in the law, and a delayed (time-lag) increase among underage drinkers. This effect cannot be satisfactorily attributed solely to factors associated with general increases in drinking or driving among young people, or with more vigorous reporting by police of collisions among young drivers. The effect of the legal change occurs in addition to the effects of more general increases in drinking and driving.

There is no evidence that factors associated with reporting account for any of the increased incidence. Unfortunately, we have not been able to test this question directly, so it clearly remains possible that some changes in reporting practices may have occurred. However, the increased incidence in collision involvement is so large and the basis for our inferences so substantial that evidence of some change in reporting practices would not warrant different inferences.

These findings corroborate and supplement those of other researchers. All of the well-designed studies we reviewed did infer an effect of the lowering of the drinking age on the collision involvement of young drivers. The current study has employed a longer time series to examine the long-term impact of the legal change. What we have found is that the effect is large proportionally and numerically and that its actual magnitude can only be appreciated with an extended time series.

These findings have serious implications from both theoretical and programmatic perspectives.

THEORETICAL IMPLICATIONS

The two competing frameworks, the socio-cultural model and the distribution of consumption model, lead to different expectations as to whether lowering the legal drinking age would lead to an increase in collision involvement among young drivers. Based on the socio-cultural model, one would expect no increase in the incidence of alcohol-related damage. The distribution of consumption model leads to a prediction of an increase in alcohol-related damage. The research that we have reviewed and the new data that have been presented affirm the superior predictive power of the distribution of consumption model over the socio-cultural model. In a previous study (Whitehead and Harvey, 1974), we also ascertained that the explanatory power of the distribution of consumption model was superior to the socio-cultural model. We also suggested that they complement each other to some extent; that is, each accounted for some of the variance. In the present case, the models lead to highly divergent predictions and the data support only one of them.

Some advocates of the socio-cultural approach to understanding and preventing alcohol-related damage do favour lowering or eliminating minimum ages for the purchase and consumption of alcoholic beverages as a single and independent step that would bring about a positive effect. Others, however, might suggest that the beneficial effect would flourish if the drinking age was removed as part of a set of changes that further encouraged the integration of drinking practices and the removal of inconsistencies and contradictions in regulations and expectations about drinking. The drinking age was not lowered within a context of sweeping changes designed to further integrate drinking practices or, as Plaut (1967) suggests, to create national norms about drinking. However, we fail to see that this consideration really alters the conclusions reached above. We do not know how to go about establishing national (or local) norms about anything, let alone something as complex as the use of alcoholic beverages in North America, where such fundamental issues as "wet-dry" remain contentious.

Advocates of the socio-cultural model appear not to be troubled with the fact that almost any measure to further integrate drinking practices would lead to an increased consumption of alcoholic beverages (cf. Whitehead, 1975a). They believe that the social context within which drinking takes place is far more important in the etiology of damage than the amount of absolute alcohol consumed. It is this perspective that leads to mistaken notions about the drinking practices

of Italians and peoples of other European countries.[1] Continental drinking practices, as they are frequently called, are considered to be civilized and to promote moderation because alcohol is "no big deal" and it is frequently consumed with meals in family settings. We agree that drinking in such settings is not likely to lead to public drunkenness, but there is no apparent protection from physical complications of consumption.

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1. For instance, apparently not recognizing the fact that Italy has high rates of death from liver cirrhosis associated with its high average level of consumption (de Lint and Schmidt, 1971b), advocates of the socio-cultural model keep pointing to Italy as an exemplar of drinking practices that do not result in damage. Examine these quotations from Blacker, Plaut, Chafetz, Wilkinson and Straus.

> *In studies (Balboni, 1963; Lolli et al., 1953; Lolli et al., 1958; Lolli, 1963; Williams and Straus, 1950) of Italians and Italian-Americans, the rate of alcoholism is relatively low. In Italy, per capita consumption of wine is very high (second only to the French) and drinking is done almost exclusively with meals. Wine is a normal part of the daily diet and it is used frequently... Drinking takes place at a very young age among children and no special "big deal" is made about drinking behavior (Blacker, 1966).*
>
> *The nature of Chinese, Jewish, and Italian drinking patterns suggest that drinking alcoholic beverages primarily in association with other activities creates certain safeguards against destructive and dangerous types of drinking (Plaut, 1967).*
>
> *What pleased me...was the Italian way of drinking. In a few words, the native Italian drinks as he does most everything: naturally. He makes no fuss about it. When the Italian sits in a restaurant with his wife and children and friends, the wine is just another substance on the table. The children are provided their fair share, and I believe that everyone knows - or ought to - that Italy has little or no problems with alcohol. Drinking becomes a way of life early; it is then that liquor becomes a staple of diet for always. Thus, the problems that Italians develop later do not manifest themselves in alcoholism. (There is evidence, however, that when Italians move to another culture and take on the drinking attitude of, say, the Americans, they begin to develop alcohol problems. In other words, the protection available to the native Italian, where his drinking is concerned, becomes lost when he finds himself in a culture where unhealthy attitudes toward liquor exist.) (Chafetz, 1965; emphasis mine).*
>
> *Among the countries of western Europe, France is often considered by medical experts to have the highest rates of alcoholism and drunkenness, while Italy is considered to have about the lowest...the Italian culture makes much less of an issue of drinking than does the French (Wilkinson, 1970).*

If some of these quotations seem a bit dated and there is question about whether this line of thinking remains alive and well, consider the following from Straus (1976):

> *Several studies of the drinking practices of Italians in both Italy and the United States have identified alcohol as an integral part of dietary beliefs and customs. Drinking and eating are inseparable activities. Drinking usually involves wine, which has low alcohol content, and excessive drinking usually occurs in the context of excessive eating. Even when large amounts of alcohol are consumed, they are taken slowly and interspaced with food, which slows the rate of absorption. Intoxication, when it does occur, is in the context of social conviviality and is considered in the same light as indigestion or other results of gluttony. Alcoholism is rare.*

Countries with continental drinking practices such as France, Italy, Spain, and Portugal, have high levels of acceptability of the use of alcoholic beverages. These countries also have high average levels of consumption and high rates of alcohol-related physical damage such as liver cirrhosis. It is a myth that high levels of consumption can prevail without associated damage. If one wishes to find groups that have low rates of alcohol-related damage, one must look for groups that have low overall rates of consumption of alcoholic beverages. One must not mistake groups that have high proportions of the population that use alcoholic beverages on a regular basis for those that have high levels of consumption. If the amount consumed at each instance of drinking is small, the overall level of consumption is apt to be fairly low. Orthodox Jews have low rates of alcoholism, not because they have a high proportion of people who use alcoholic beverages at least occasionally, but because their overall level of consumption is low.

SOCIAL POLICY

There are two sets of implications for social policy that emerge from this study and its bearing on previous research and earlier theoretical formulations. The first set of implications have to do with the primary prevention of damage among young drinkers and young drivers. The second set deals with general strategies for the primary prevention of alcohol-related damage.

Young People. Young drivers had high rates of automobile collisions before the legal drinking age was lowered (see, for example, Pelz and Schuman, 1973). Since mid-1971, the incidence of alcohol-related collisions has particularly increased. In addition, evidence of increases in alcohol-related problems among young people have become manifest in schools, at extra-curricular activities such as dances, and at centres where treatment for alcohol-related damage is provided. For instance, according to Smart and Finlay (1975), prior to 1970, less than two percent of admissions to Addiction Research Foundation Clinics and detoxification centres were under the age of 21, but by 1974, the rates were four percent and 3.5 percent respectively.

Due to the increased level of damage in the form of automobile collisions that has followed the lowering of the legal drinking age, it makes considerable sense to increase the drinking age from the point of view of traffic safety. There is, of course, a degree of arbitrariness associated with any criterion based on age. This ought not lead us to conclude that no criterion involving age is appropriate. Rather, it leads to a consideration of what age may be the best criterion in terms of having a favourable impact that is optimum even if it is not the largest that is theoretically possible. Data from the field of traffic safety are of some assistance in this respect, but some useful guidance also stems from examining other areas of alcohol-related problems.

Eighteen and 19-year-olds as a category have poor driving records even in situations where drinking alcoholic beverages is not involved (Pelz and Schuman, 1973). When they drive while impaired, they are seventy times more likely to die in a motor vehicle collision than the average non-impaired driver. According to Warren (1976), this "total impairment risk factor" is more than twice that of persons in older age categories and is exceeded only by drivers who are 16 and 17 years of age. Thus, from the point of view of traffic safety, increasing the drinking age to twenty has considerable merit.

There is support for this measure from another point of view also. The incidence of alcohol-related collisions increased among 16- and 17-year-olds when the drinking age was lowered as a result of illicit drinkers being able to obtain alcoholic beverages and means of identification from their slightly older schoolmates and classmates who were licit drinkers. The lowering of the drinking age made the secondary school the prime link between licit and illicit drinkers. This meant that the lowering of the drinking age not only had adverse effects on the new licit drinkers, but also a spill-over effect on youngsters aged 17, 16 and even younger who now had easier access to persons who could help them to obtain alcoholic beverages. We advocate measures that would take alcoholic beverages out of our high schools.

The optimum age will differ somewhat from jurisdiction to jurisdiction. In most states and provinces, it is apt to be 19, but in some, such as Ontario, it is 20. The high school system in Ontario extends to grade 13. Many grade 13 students turn 19 years of age during that year. Therefore, Ontario would be best served with a drinking age set at 20, whereas provinces that have only grade 12 would have 19 years of age as the optimum.

This recommendation is consistent with the resolution passed at the 1976 annual conference of the Canadian Foundation on Alcohol and Drug Dependencies:[2] Provinces with grade 12 were encouraged to increase the drinking age to 19 and those with grade 13 to increase the drinking age to 20. Nova Scotia has grade 12 and lowered its drinking age only to 19, never to 18. Saskatchewan had grade 12. It lowered its drinking age to 18, but after having suffered the same types of problems we have discussed above, the government decided to reverse its earlier decision and increased the drinking age to 19. The increase became effective 1 September, 1976. The state of Maine increased the drinking age from 18 to 20, effective in mid-1977 (London Free Press, 1977).[3]

This recommendation was also made by an Expert Committee on Drinking and Driving of the Addiction Research Foundation to the Select Committee on Highway Safety of the Ontario Legislature (Ennis et al., 1977).

Increasing the drinking age is looked upon very favourably by a great many people in our society, both young and old. Surveys have been conducted in a number of Canadian cities on this question and what we find is a large and growing proportion of the population 18 years and over who wish the drinking age to be increased. In Fredericton, 58 percent of the people want the drinking age increased, and 82 percent of these want it increased to age 21 (Whitehead, 1976d). We did a survey in Saskatchewan one year before the decision was made to increase the drinking age. At that time, 48 percent of the urban respondents (city of Regina) and 53 percent of the respondents from rural communities favoured increasing the drinking age (Whitehead, 1975b). Another survey was conducted just before the decision was made to increase the drinking age, but the results of this study were not known to anyone until after the decision to increase the drinking age. At that time, 74 percent of the urban respondents and 73 percent of the rural respondents wanted the drinking age to be increased (Whitehead, 1976e). In London, in the summer of 1976, 48 percent of the population wanted the drinking age to be increased and 76 percent of these wanted it increased to at least 20 years of age (Frankel, 1977). Thus, an increase in the drinking age to 19 in most jurisdictions and 20 in others would be consistent with the vox populi and would make sense from the perspective of alcohol-related problems generally and from the point of view of traffic safety in particular.

Other measures have potential for reducing damage among young drivers such as issuing probationary licenses to young drivers up to the age of 19 or 20 (Whitehead and Ferrence, 1976; Ferrence and Whitehead, 1977). The fear of losing their license as a result of even relatively minor infractions may help young drivers through the difficult period during which their risk of collision involvement is highly elevated. Measures aimed at deterring impaired driving among all drivers should have their share of positive effects on younger drivers as well. Thus, increased breath testing at the roadside, so as to raise the objective likelihood of apprehension, and media attention to the increased enforcement, in order to increase the perceived likelihood of apprehension, should have beneficial effects across a broad range of impaired drivers (Whitehead, 1975c; Whitehead and Ferrence, 1976; Ferrence and Whitehead, 1977).

General strategies of prevention. Our examination of the impact of the lowering of the drinking age on one type of damage has added to our understanding of the relative relevance of major approaches to the prevention of alcohol-related damage: the socio-cultural model and the distribution of consumption model.

It should be recalled that the socio-cultural model pays little, if any, attention to the amount of consumption of alcoholic beverages in favour of examining the set and setting within which drinking takes place. Reasons to pay more attention to the distribution of consumption model mean that more emphasis must be placed on the overall level of consumption. The report by an internationally-renowned team of researchers in the field of studies on alcohol came to similar conclusions and pointed out that increasing levels of consumption constitute a worldwide phenomenon, not a localized one (Bruun et al., 1975). Measures that slow the rate of increases in consumption clearly appear to be necessary if we are to stop experiencing increased rates of damage and their constantly spiraling costs.

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2. Now called the Canadian Addictions Foundation.

3. The legislation was signed 17 March, 1977 to take effect 90 days after that legislative session adjourns (exact date unknown).

The National Institute on Alcoholism and Alcohol Abuse has estimated that the economic costs associated with alcoholism and alcohol abuse are $25 billion per year in the United States; the largest single part, over $9 billion in the form of lost work productivity (Beauchamp, 1975; Light, 1975). In Canada, the Non-Medical Use of Drugs Directorate (1975) has estimated that the cost of alcoholism is about $1 billion per year. Any such attempts to produce global estimates of costs are bound to be open to serious criticism and much mild quibbling (see, for example, Light, 1975). These are ballpark figures that are likely to overestimate some things and underestimate others. Some forms of damage cannot even be translated into economic terms, but they are real and tragic nevertheless. The suffering, emotional deprivation, shame and scarred psyches of the spouses (cf., Edwards et al., 1973) and children of alcoholics (cf., Cork, 1969) are some of those non-economic costs. We do not have an answer as to why the estimate for the U.S. should be twenty-five times that of Canada while its population is only ten times as great. More precise estimates would be of some use, but we are certainly not dependent on degrees of precision that are yet to be achieved in order to understand that we are faced with a public health problem that is large, growing and onerous from social and economic points of view.[4]

Not at issue is whether one model is perfect and another totally without merit. What is at issue is the question of which model offers the greatest hope for discovering and implementing effective mechanisms of prevention. Critics of the distribution of consumption model have been able to point to a weakness here (Skog, 1973) and a need for better substantiating data there (Miller and Agnew, 1974), but the general weight of the evidence continues to point to the importance of this approach to prevention. Skog (1977) has indicated that there are mathematical and statistical relationships between the average level of consumption and the proportion of heavy drinkers that are theoretically possible and not in accord with some propositions of the distribution of consumption model. However, while they are theoretically possible, they do not appear to exist empirically and we do not know how to alter the apparently inextricable link between the overall level of consumption and proportion of heavy drinkers. This is certainly not to suggest that the search must or should stop. Quite to the contrary, research should continue and at an even faster pace than it has in the past. In the meantime, however, our best efforts must be devoted to those areas and in those directions that are most apt to be successful. This means guarding against further liberalization of alcohol control measures, insuring that the price of alcoholic beverages relative to disposable income does not decrease and taking advantage of opportunities to further test the relationship between availability and consumption and between consumption and damage.

Governments need to be convinced that the escalating costs of health care that they now define as so problematical will not be solved by closing a small hospital here and withdrawing a few beds from active service there. If there is to be some relief from the rapidly rising costs of health care, part of the solution should involve approaches to prevention that could be effective. Alcohol-related damage is, of course, only one of many types of damage where prevention should be tried (see, for example, Lalonde, 1974), but it is one of them.

Thus far, programmes that have been mounted in the name of prevention have been designed to inform people or change their attitudes about drinking rather than trying to influence behaviour directly. Some of us have argued that this is because the former appear more safe, and are apt to be well received on the part of the general public, even though they are likely to be ineffective in meeting the desired objective of changing behaviour in such a way as to reduce the incidence of alcohol-related damage. Whether concern about moving too far ahead of public opinion was justified in the past is an open question. It is increasingly clear, however, that such concern may not now be justified. Studies have been conducted in a number of Canadian communities for the purpose of ascertaining, among other things, the degree of receptivity to alcohol control measures that are consistent with the distribution of consumption approach to prevention. The details of these studies are available in the original reports so they will not be repeated here. However, we will mention a few of the findings for purposes of illustration.

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4. For a summary of some of the economic costs of alcoholism in Canada, see Information Review (1976).

These studies have been conducted in Fredericton, New Brunswick (Whitehead, 1976d), London, Ontario (Frankel, 1977), Regina, Saskatchewan and rural areas of Saskatchewan (Whitehead, 1975b; 1976e). Some differences in attitudes exist from place to place; and where the same community is studied at different times, there are differences across time (Table 5.1). However, the differences across time are generally in the direction of greater acceptance of alcohol control measures that are consistent with the distribution of consumption model. The differences from place to place are surprisingly small when one considers the wide geographical spread across the communities involved. The following examples examine some of these items in terms of the average responses across communities in 1976 (Table 5.1). Eighty-three percent of respondents agree that, if it could be successfully proven that increasing the price of alcoholic beverages would reduce the amount of problem drinking, they would agree to such a price increase. There is a fair amount of agreement (70 percent) that the practice of drinking wine with meals should not be encouraged. Respondents in these communities displayed a high degree of familiarity with the relationship between so-called "social drinking" and problem drinking: 88 percent agreed that, if social drinkers increased their consumption, there would be more problem drinkers and 74 percent agreed that, if social drinkers decreased their consumption, there would be fewer problem drinkers. Seventy-eight percent of respondents agreed that the liberalization of drinking laws over the past few years has led to an increase in problems related to drinking. Finally, 69 percent of the population want the drinking age to be increased.

Therefore, there already exist attitudes favourable to measures that are consistent with the distribution of consumption model. There is room for improvement and some of this improvement may be fostered by programming designed to increase the level of awareness of the general public about the practicality of some of these measures. Rather than having media programmes that try to convince individuals to drink responsibly, it would appear to be far more advantageous to raise people's awareness about the individual and social damage associated with the consumption of alcoholic beverages and the need for social control measures that are likely to bring about a decrease in damage that results from drinking.

Our studies show that people are willing to have the mechanism of price used in the prevention of alcohol-related damage if it can be demonstrated that it is likely to work. Our studies also show that there is a fair amount of skepticism about whether changes in price can result in changes in levels of consumption. This suggests a need for programming that would raise people's level of awareness about the extent to which demand can be altered. There are studies that demonstrate that, not only so-called "social drinkers", but also alcoholics respond to decreased availability of alcoholic beverages (Ahlström-Laakso, 1975; Brün et al., 1975; Babour, 1977). The implication of such research for successful social policy needs to be made clear to members of the general public as well as to policy advisors and legislators.

CONCLUSION

All of the answers are not known; they never will be. We do have a considerable amount of information, however, and we will have more in the future. When the available information is weighed, we find a preponderance of evidence that suggests the need to address forthrightly the issue of the primary prevention of alcohol-related damage. The preponderance of evidence indicates that application of practices that are derived from or consistent with the distribution of consumption model for understanding and preventing alcohol-related damage hold the greatest promise (Schmidt and Popham, 1977). If we wish to have no higher and even lower rates of damage in the future, this will likely require no increases and maybe some decreases in average levels of consumption of alcoholic beverages. This will require the application of control measures that alter the social, economic, and legal components of our environment. Some of these control measures include a policy of tax/price control that keeps alcoholic beverages from becoming more economically accessible, passage of minimum drinking age laws that keep alcoholic beverages out of high schools, enforcement of laws that restrict availability of alcoholic beverages and passage of legislation that is apt to deter the introduction of additional drinking practices.

TABLE 5.1

Percent of the Population Who Agree, Disagree, or Are Undecided About a Variety of Alcohol Control Measures in a Number of Canadian Cities

Question		Fredericton	London		Saskatchewan Regina		Rural		Average
		1976[a]	1975[b]	1976[b]	1975[c]	1976[d]	1975[c]	1976[d]	1976
If it could be successfully proven that increasing the price of alcoholic beverages would reduce the amount of problem drinking in this province, then would you agree to such a price increase?	AGREE	84	69	81	75	82	76	84	83
	DISAGREE	13	28	14	22	16	19	13	14
	UNDECIDED	3	3	5	3	2	5	3	3
The practice of drinking wine with meals should be encouraged.	AGREE	15	25	21	17	17	16	21	18
	DISAGREE	69	70	69	77	71	73	69	70
	UNDECIDED	16	5	10	6	12	11	10	12
If those persons who are social drinkers drank more than they do now, we would have a society in which there would be more problem drinkers.	AGREE	92	85	80	89	88	90	90	88
	DISAGREE	7	9	12	8	8	6	4	8
	UNDECIDED	1	6	8	3	4	4	6	4
If people who are social drinkers drank less than they do now, we would have a society in which there would be fewer problem drinkers.	AGREE	78	56	58	64	72	75	88	74
	DISAGREE	11	39	33	28	21	20	7	18
	UNDECIDED	11	5	9	8	7	5	5	8
The liberalization of drinking laws over the past few years has led to an increase in problems related to drinking.	AGREE	71	65	84	67	83	54	75	78
	DISAGREE	20	25	10	25	10	33	9	12
	UNDECIDED	9	10	6	8	7	13	16	10
In your opinion, should the legal age for purchasing alcoholic beverages be increased, decreased, or remain the same?	INCREASED	58[e]	52[f]	72[f]	48[f]	74[f]	53[f]	73[f]	69
	DECREASED	2	2	2	2	2	2	-	2
	SAME	40	44	26	48	23	41	22	28
	UNCERTAIN		2	-	2	1	4	5	1

a) Source: Whitehead (1976a)
b) Source: Frankel (1977)
c) Source: Whitehead (1975)
d) Source: Whitehead (1976b)
e) At the time the question was asked, the legal drinking age was 19.
f) At the time the question was asked, the legal drinking age was 18.

All such attempts should be carefully evaluated and assessments need to continue to be made as to whether specific measures actually contribute to meeting the desired objectives. Measures that are not productive should be dropped. This could well mean that we will, in time, achieve a situation where we may have fewer alcohol control measures than is currently the case, but where they will be more effective.

Some of these considerations may appear to be somewhat distant from the concern of the implications of having lowered the drinking age. They are not. These matters are tied together in terms of their theoretical implications and the suggestions for public policy that stem from them. The change in drinking age provided an opportunity to examine some basic and more practical questions relevant to studies on alcohol. As stated earlier, what is done with the information is not a matter of pure and simple scientific or logical deduction. The inferences allowed for by our design and the studies of others have been weighed and judgments have been made as to their meaning and their implications for social policy. Others may choose to make different judgments. Issues continue to exist and the debate about them is far from closed. But, action, frequently in the form of inaction is being taken all the time to combat this social problem. This opportunity has been taken to share, in a fairly integrated way, one set of judgments about the direction of such action.

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